United States
Office of Personnel Management

Air Traffic Control Series

GS-2152

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June 1997, HRCD-3

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Air Traffic Control Series

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Air Traffic Control Series

GS-2152

CONTENTS

SERIES DEFINITION

This series includes positions concerned with: (a) the control of air traffic to insure the safe, orderly and expeditious movement along air routes and at airports when a knowledge of aircraft separation standards and control techniques, and the ability to apply them properly, often under conditions of great stress, are required; (b) the providing of preflight and in-flight assistance to aircraft requiring a knowledge of the information pilots need to conduct safe flights and the ability to present that information clearly and concisely; or (c) the development, coordination, and management of air traffic control programs. Positions in this occupation require an extensive knowledge of the laws, rules, regulations and procedures governing the movement of air traffic.

This standard republishes the introductory material and Parts II and III of the standard for this series issued in January 1977 (TS-26), along with revised grade level criteria for flight service station positions which supersede the criteria in Part I of the July 1968 standard (TS-75).

STATEMENT OF COVERAGE

In addition to positions involving direct control of air traffic and supervision of control operations, the following groups of positions are illustrative of those included in this series when the paramount qualifications required are extensive technical air traffic control knowledge and understanding of the laws, rules, regulations, and procedures governing the movement of air traffic:

-- Positions involved primarily in monitoring the air traffic control work of other than Federal Aviation Administration facilities, in liaison with other agencies, or in serving as advisors to other agencies;

-- Positions involving air traffic control research and development work and planning the National Airspace System, which do not require professional knowledge and competence is engineering, a physical science, medicine or other professional fields;

-- Positions concerned with development of rules in regard to airspace utilization and with the resolution specific airspace cases; and

-- Positions which involve participation in the development of military air regulations, procedures for the security control of aircraft, methods of integrating civil and military air traffic, and in international conferences directed toward establishing worldwide uniformity in control, flight assistance, and communications procedures.

EXCLUSIONS

1. Positions concerned with developing, administering, or enforcing regulations and standards concerning civil aviation safety, including: (1) the airworthiness of aircraft and aircraft systems; (2) the competence of pilots, mechanics and other airmen; and (3) safety aspects of aviation facilities, equipment and procedures are classified in the Aviation Safety Series, GS-1825.

2. Positions concerned with air traffic control planning, research and development, or other work in the National Airspace System when the performance of the work requires professional knowledge of engineering, a physical science, medicine or other recognized professional field are classified in an appropriate professional series.

3. Positions concerned primarily with aircraft assignment, scheduling, or load planning work are classified in the Dispatching Series, GS-2151.

4. Positions concerned with communications work which does not require application of the laws, rules, regulations and procedures governing the movement of air traffic are classified in the Teletypist Series, GS-0385; the Radio Operating Series, GS-0389; the General Communications Series, GS-0392; or in other appropriate series depending upon the type of communications equipment used and the primary qualifications required.

5 Positions which require primarily a technical knowledge of computer requirements and techniques are classified in the Computer Specialist Series, GS-0334. Positions responsible for such functions as adaptation, programing, test and implementation or operational surveillance in connection with automated radar systems should be examined closely to determine whether such positions are appropriately included or excluded from the GS-2152 series.

OCCUPATIONAL INFORMATION

The objective of air traffic control is insure the safe, orderly and expeditious movement of aircraft through the nation's airspace. To accomplish this objective, air traffic control work is divided along three major functional lines:

-- Preflight briefing and assistance, and advisory services to pilots during flight;
-- Providing control and separation of en route air traffic; and
-- Control and separation of air traffic at airports.

These three functional responsibilities are in turn divided among the three different types of air traffic facilities -- flight service stations, air route traffic control centers and air traffic control terminals. To carry out these responsibilities and coordinate control actions between these facilities requires a vast communications network that links the three types of facilities directly to the aircraft and to each other.

Flight Service Stations

Flight service stations provide a variety of weather, navigational, and other information to assist pilots in planning a safe flight. During flight they provide current weather briefings, and other information useful to pilots. Flight service stations receive and coordinate aircraft flight plans with other air traffic facilities, initiate search and rescue action when aircraft fail to arrive within stated time limits, and assist pilots who are lost or disoriented. At some locations flight service stations provide advisory services to pilots operating into or from airports where there is no air traffic control tower or during periods when the tower is closed.

Air Route Traffic Control Centers

Air route traffic centers provide aircraft operating in controlled airspace under instrument flight rules (IFR) procedures, with control and separation from other IFR aircraft while en route along major airways or over oceanic areas. While the centers also provide traffic advisory service (workload permitting) to aircraft operating under visual flight rules (VFR) procedures, their primary responsibility is to the en route IFR aircraft. The centers utilize constant radar surveillance to issue speed, altitude and directional instructions to pilots for the purpose of keeping aircraft properly separated. In addition to their responsibilities for en route aircraft, centers also provide approach control service to aircraft operating into certain airports within the center's assigned area. Centers coordinate the orderly exchange of the control of aircraft between themselves and the terminal facilities in their area, and take action to meter the flow of air traffic to avoid delays and bottlenecks along the air routes.

Air Traffic Control Terminals

The principal function of the terminal facility is to control air traffic within an area surrounding an airport or airports. A terminal may be concerned only with air traffic operations for the airport at which the terminal is located, or it may provide air traffic control for adjacent airports. Some terminals, in addition to operations at the airport, may provide control and separation of aircraft transiting the airspace controlled by the terminal. Whether located at a civilian airport, a military base, or a joint military/civilian airport, all terminals perform similar functions such as:

-- Issuing control instructions to provide separation and assure the orderly and expeditious movement of aircraft departing, landing, approaching for landing or flying within and between terminal areas;

-- Controlling the movement of aircraft and vehicles on the airport's surface;

-- Furnishing information to pilots concerning clearances to operate aircraft, weather and field conditions, and pertinent operating and procedural instructions;

-- Relaying messages concerning operation and control of aircraft between pilots and other air traffic facilities; and

-- Notifying fire and rescue services in the event of actual or potential accident on or in the vicinity of the airport.

Positions in this occupation require a significantly high level of mental and physical abilities to successfully perform the work. During training to develop full performance level skills, controllers must learn, and retain for instant recall and reference, a considerable body of knowledge related to meteorology, air navigation, standard air traffic control communications procedures and phraseology, performance characteristics of the various types of aircraft, the types and uses of aids to air navigation, and the regulations and procedures governing the control and separation of air traffic.

In addition to possessing this body of technical air traffic control knowledges, controllers must be qualified to perform the duties of the assigned positions of operation in their facility. This requires a detailed and comprehensive knowledge of the facility and the surrounding geographic area, airway routes and structures, kind and location of aids to navigation, communications systems, working relationships with other air traffic facilities, and the standard operating procedures for that particular facility. Actual duties assigned to controllers must conform to Federal Air Regulations, policies, procedures and standards established by the Federal Aviation Administration, and local operating procedures peculiar to the facility.

Air traffic controllers work in a constant "real-time" situation to control and separate air traffic. The controller must always operate within certain standards and in accordance with certain guidelines. In the real time framework the guidelines must, in effect, all be committed to memory. There is no chance to refer to them for assistance during actual control work. Similarly, there is no opportunity for prolonged reflection or for studied consideration before making decisions or choices on control actions. Typically, decisions must be made immediately, and once made, they are almost always irrevocable. Full performance level controllers are also generally required to provide on-the-job training for trainee and developmental controllers in live traffic situations. In this instance the senior controller has a dual responsibility, the actual control of traffic plus the instruction, monitoring and evaluation of the developmental controller's actions.

Changes in the Occupation

In recent years a number of technological changes have occurred in air traffic control work. For example, there has been increased use of automated radar tracking systems such as the Automated Radar Terminal System (ARTS) and Radar Data Processing (RDP) in the centers. Recent enhancements to the radar control of aircraft include automated sub-systems which warn controllers that a particular aircraft may be operating at a potentially unsafe altitude or that two aircraft may be projected to conflict at some point in their flight. Computerized weather data provide flight service station specialists real-time weather information for use in briefing pilots. Overall, the increased use of automated systems has provided additional tools to increase the efficiency of air traffic control work and to enhance the safety of flight.

Also, in recent years a new class of aircraft, the wide-body heavy jets, has been introduced to aviation. For air traffic control this has meant the application of different separation standards and control procedures to assure the safe intermingling of these aircraft with others already in the aviation inventory.

Automation and new technology will increasingly be applied to the air traffic control system in order to keep pace with corresponding changes in the aviation industry and to cope with the projected growth of aviation activity. System enhancements which provide a metered flow and spacing of traffic may well be required to handle the increased air traffic activity projected to occur in the near future.

All of these changes have not reduced the air traffic controller's responsibility for safety of flight and the protection of life and property. Neither have they materially altered the basic relationship of the controller to the pilot. In some instances these changes have brought about some increased sharing of responsibility between controller and pilot, such as the responsibility to alert pilots, when data are available, to possible altitude deviations.

Air traffic controller training

Trainee controllers undergo rigorous and extensive instruction and on-the-job training to prepare them for full performance level positions in their assigned work specialization. They progress through the training program based upon meeting specific time-phased objectives (i.e., training and qualification to operate certain control positions) which vary according to work specialization and the particular operating requirements of the facility to which they are assigned.

The Federal Aviation Administration, the major employing agency, follows an "up or out" policy which, in effect, means that those trainee and developmental controllers who do not show satisfactory progress are not allowed to continue in their particular training program. The intent is that all developmental controllers must show satisfactory progress during training and must ultimately qualify on the appropriate number of positions of operation at the full performance grade level.

This requirement stems from the need for facility management flexibility in meeting their daily staffing needs with controllers fully qualified to perform the work, and the need to implement periodic rotational work assignments to afford controllers relief from the more stressful control situations. Rarely, if ever, will there be any continuing positions in a facility for controllers at less than the normal full performance grade level.

For these reasons, this standard does not attempt to describe all of the possible combinations of work and training assignments at each of the less than full performance grade levels in either of the three work specializations, except at the entrance and trainee levels, (GS-5, GS-7 or GS-9). Instead, the grade level descriptions focus primarily on the typical full performance level work situations in each of the specializations.

Future adjustments to the evaluation criteria

The traffic density ranges (i.e., average hourly operations counts) used in part II and part III of this standard were developed using flight operations data from the 1975-1976 period. Because of the many variables which may affect the difficulty and complexity of air traffic control work such as future technological changes to the equipment, changes in the aviation industry, differing patterns of growth and change in air traffic activity, and modification or extension of air traffic control services it may be necessary to periodically adjust the traffic density measures for different categories of facilities and their respective work levels.

While there is currently a linkage of the conceptual descriptions of the various grade levels with their associated traffic density ranges, this linkage is not expected to last for all time. Using agencies, in their reviews of the application of these traffic density criteria to the various controller work situations, should assess the continued validity of this linkage and, where indicated, recommend appropriate adjustments.

ORGANIZATION OF THE STANDARD

Part I

This part includes positions concerned with providing flight assistance to aircraft prior to and during flight in domestic areas or along overseas and international routes.

Authorized titles:

Air Traffic Control Specialist (Station)

Supervisory Air Traffic Control Specialist (Station)

Part II

This part includes positions which are responsible for issuing air traffic control instructions and providing flight assistance to aircraft flying within a designated area around an airport or airports.

Authorized titles:

Air Traffic Control Specialist (Terminal)

Supervisory Air Traffic Control Specialist (Terminal)

Part III

This part includes positions which are responsible for providing control instructions and advisory service to aircraft flying en route within designated areas.

Authorized titles:

Air Traffic Control Specialist (Center)

Supervisory Air Traffic Control Specialist (Center)

COMBINED POSITIONS

Positions in combined facilities (e.g., combined stations and terminals) are included in this series but are not specifically described. These positions should be evaluated by comparison with the classification criteria in this standard. The appropriate suffix (e.g., Terminal or Station) should be added to the basic title of such positions to indicate the paramount duties and responsibilities.

Authorized titles:

Air Traffic Control Specialist

Supervisory Air Traffic Control Specialist

STAFF AND RELATED POSITIONS

Many research and development, staff, technical support or other positions may be appropriately included in this occupation provided the paramount qualifications required are extensive technical air traffic control knowledge and understanding of the laws, rules, regulations and procedures governing the movement of air traffic. Such positions may include:

-- Data systems specialists in terminals and centers;

-- Area specialists in centers;

-- Planning and procedures specialists in terminals;

-- Evaluation and proficiency development specialists in terminals, centers and stations;

-- Flow controllers in centers; and

-- Military liaison and security specialists in centers.

However, specific evaluation criteria for these and other such positions have not been included in this standard. These positions should be evaluated using the grade level criteria (in the applicable work specialization) for operating controller positions with appropriate reference to the evaluation criteria in classification standards for related work. The authorized titles for these positions are:

For research and development positions

Air Traffic Control Specialist (Research and Development)

Supervisory Air Traffic Control Specialist (Research and Development)

For staff, technical support, or other positions

Air Traffic Control Specialist

Supervisory Air Traffic Control Specialist

SUPERVISORY POSITIONS

This standard provides grade level criteria for nonsupervisory positions only. Supervisory positions should be classified by reference to the Supervisory Grade-Evaluation Guide, Part II.

PART I -- AIR TRAFFIC CONTROL SPECIALIST (STATION) GS-2152

The primary function of the flight service station is to provide pilots with a variety of information and assistance necessary for planning and conducting a safe flight. A network of flight service stations, linked by an extensive communications system, provides assistance to pilots operating within the national airspace system and along certain overseas and international routes. While these services are provided by flight service stations to all segments of aviation including commercial and military, the largest single user is the general aviation pilot.

Flight service specialists brief pilots on weather conditions occurring or expected to occur along their intended route of flight and at the destination airport. They advise of the existence or development of potentially hazardous meteorological conditions, suggest alternative routings and, when appropriate, recommend that flights not be attempted. The specialists advise pilots of airport conditions, operational status of navigational aids, and of activity in special-use air space such as restricted or military operating areas along the planned route of flight.

Based on their knowledge of airway route structures and air traffic procedures, flight service specialists assist pilots in planning the route of flight, in making flight computations, filing flight plans, and obtaining the proper clearances to fly in controlled airspace. Flight service specialists are responsible for developing, disseminating and monitoring the currency of Notices to Airmen (NOTAMs). NOTAMs provide information on significant aeronautical conditions (e.g., operational status of navigational aids), the timely knowledge of which is essential to planning flight operations.

Flight service specialists provide current and forecast weather data and flight planning information to en route aircraft. They request and disseminate pilot reports of significant weather conditions which may affect the safe operation of aircraft in their area of responsibility. In certain locations,

specialists monitor the progress of flights over mountain, water or swamp areas. At non-towered airports, or at locations where the tower is open less than twenty four hours, the specialists provide airport advisory services to landing and departing aircraft. This advisory service includes furnishing arriving and departing aircraft with field and weather conditions, runway(s) in use, and location of known traffic, and alerting fire, rescue and other emergency equipment in the event of actual or potential emergency.

Flight service specialists provide assistance to pilots who are lost or are in an emergency situation. By use of navigational aids, reference to topographical features or radio direction finding equipment pilots are re-oriented or directed to a landing area. Station specialists initiate search and rescue operations to locate aircraft operating under visual flight rules which fail to report their arrival within prescribed time limits.

At flight service stations which provide assistance to aircraft operating along overseas and international routes, specialists provide information relative to International Civil Aviation Organization (ICAO) rules and procedures to be observed, and flight planning data pertinent to the destination country. Because these flights are made over water and/or sparsely populated areas, pilot briefings must cover appropriate action in hazardous situations and pertinent rules and restrictions to minimize the chance of violation of air traffic regulations.

A number of flight service stations provide En Route Flight Advisory Service (EFAS) to airborne aircraft in their assigned area. The objective of EFAS is to provide in-flight aircraft with timely and meaningful weather advisories which enable pilots to continue or terminate their flight or to alter course to avoid adverse weather conditions. EFAS involves the continuous interchange of information between pilots (who observe actual in-flight conditions), the EFAS station (the focal point for collecting, analyzing and disseminating in-flight weather information) and aviation forecasters.

ANALYSIS OF CLASSIFICATION FACTORS

For positions above the trainee level, certain of the traditional classification factors are of relatively constant value and do not serve, by themselves, to differentiate grade levels. This is due to the nature of the duties and responsibilities assigned, and the requirement to provide service to pilots in a uniform and consistent manner throughout the network of flight service stations.

For flight service specialists as a group there are certain fundamental knowledges, skills and abilities required which include:

-- Thorough knowledge of aviation weather including the causes, effects, and dynamics of weather systems;

-- Ability to interpret and interpolate a variety of weather data into information useful to pilots;

-- Ability to determine the capabilities of a pilot to assure that the information presented is such that the pilot is aware of conditions expected and how they will affect the flight.

-- Detailed knowledge of the station's assigned area of responsibility including:

. operational features of assigned airports;

. location and performance characteristics of associated air navigational facilities;

. airway structures and routes;

. topography and factors affecting weather;
. air traffic control procedures pertinent to the area (e.g., preferred routes, airport traffic areas, controlled airspace and arrival/departure patterns);

. applicable airspace restrictions (e.g., military operations areas, jet training areas and low-level training routes); and

. emergency service procedures.

-- Detailed knowledge of the procedures related to flight handling, routing, airways and airspace structures, and the relationship and coordination required between flight service and other components of the air traffic system;

-- General knowledge of the performance characteristics of a wide variety of aircraft, particularly with respect to the effect of weather on safe operation of the aircraft;

-- For international flight service stations, and those which provide both domestic and international services, a comprehensive knowledge of International Civil Aviation Organization rules and procedures;

-- Skill in communicating effectively with pilots of all levels of experience in a variety of situations;

-- Ability to provide emergency service to aircraft in distress, including the determination as to the nature of the emergency and the application of remedial measures; and

-- Ability to coordinate actions with other specialists and related air traffic facilities.

While the knowledges, skills and abilities required vary only slightly in kind, the level of skills, abilities and judgments demanded of flight service specialists is influenced both by the volume of services provided and the demands of the particular work situation. This influence is discussed below and in the section titled GRADE LEVEL CRITERIA.

With respect to supervision received, the nature of most flight service work assignments generally precludes close supervisory guidance or control. Full performance level specialists are responsible for independently determining and providing to pilots the appropriate preflight briefing information based on the planned route, whether visual or instrument flight rules are used, the operating characteristics of the aircraft and the weather conditions extant, or expected to occur during the flight. Similarly, specialists providing service to en route aircraft perform their assignments independently, in a real-time environment without significant opportunity for supervisory intervention or assistance. For these reasons, a high degree of independence from supervisory control and guidance is characteristic of all full performance level flight service specialist assignments.

Meaningful and responsible personal contacts are characteristic of all full performance level work assignments. Commitment authority is inherent in all assignments involving pilot briefing and assistance to en route aircraft. While individual contacts vary in difficulty with the relative skill of the pilot contacted (i.e., the less experienced pilots typically require additional and detailed explanation of weather and flight planning data, and represent the more difficult personal contacts), overall, the mix of novice versus skilled pilots contacted will generally be similar for all flight service stations.

As regards the scope and effect of the duties performed, the objectives of flight service work are the enhancement of safety and the protection of life and property. These objectives do not vary from one location to another -- all flight service specialists feel keenly their obligation to provide such assistance to pilots as is necessary to insure that flights are conducted safely.

All of these considerations are highly significant in terms of the overall evaluation of flight service work, and have been taken into account in the development of this standard. However, since these particular factors are relatively constant in value at the full performance grade levels and do not, by themselves, serve to distinguish one grade from another, they are not separately identified or discussed in the grade level descriptions.

Influence of volume on complexity of assignments

Normally there is a relationship between the level of flight service activity and the level of knowledges, skills and abilities required of the individual specialists. Activity, in turn, is influenced by certain characteristics of each station's flight plan area. Flight plan area is defined as the geographic area encompassing all of the airports, navigational aids and facilities associated with a particular flight service station. Among the characteristics influencing the difficulty of work assignments are:

-- the number and diversity of general aviation aircraft based within the flight plan area;

-- number of public-use airports and landing areas;

-- level of aviation activity within the area;

-- complexity of adjacent airway structures and routes;

-- number of navigational aids and communications outlets;

-- exposure to varied aviation interests such as flying clubs, student pilots and transient pilots; and

-- operating procedures and requirements for coordination with other air traffic facilities.

For example, the number of general aviation aircraft based in the flight plan area has a direct bearing on the demands placed on the individual flight service specialist to provide pilot briefings. In the busier stations (i.e., those associated with the larger general aviation populations) the specialist is more frequently exposed to varied and diverse pilot briefing situations and different aviation interests such as flying clubs, student and transient pilots. In such situations, the specialists must continually adjust their consideration of such briefing factors as route and type of flight, trip length and operating characteristics of the aircraft.

The knowledges, skills and abilities required of flight service specialists are influenced by the level of aviation activity and the number of public-use airports in the flight plan area. Normally, the local operating procedures and requirements for coordinating action with air traffic control facilities are more numerous and more complex in the higher activity work situations. Similarly the larger number of airports typically associated with higher volume stations influences the knowledges required. Flight service specialists must possess a detailed knowledge of the operational features of assigned airports, including such aspects as approach and departure patterns, runway lengths and capacities, applicable control areas, and services available to aircraft.

The number of radio navigational aids within a station's area is a general indicator of the complexity of the airway structure of immediate concern to the specialists, i.e., the more navigational aids the more complex the airway structure. Flight service stations have responsibility for monitoring the performance of associated navigational aids, alerting maintenance crews when malfunctions are detected, and most important, disseminating information to pilots on the operational status of the navigational aid.

GRADE LEVEL CRITERIA

Grade levels for this part are described in terms of two closely related factors -- *the level of flight service activity* and the work situation.

Level of flight service activity is illustrated in the grade level descriptions by measures of two primary flight service functions -- pilot briefings and the aircraft contacted. Although flight service specialists perform a number of different tasks these two are considered to represent the most difficult technical demands on the full performance level specialists. For purposes of this standard, these two functions are defined as follows:

-- A pilot briefing is defined as furnishing to pilots significant weather and aeronautical information pertinent to planning or completing their intended flight. The briefing may be provided before or during the actual flight. The intent is to credit each pilot briefed regardless of the length of time spent or the number of routes or destinations involved in the flight. Responses to requests for a single item of information, information not pertinent to the route of flight, and airport advisory information do not constitute a pilot brief.

-- An aircraft contacted is defined as providing to en route aircraft pertinent flight planning, meteorological or aeronautical information. An aircraft contact may involve a request for an en route weather briefing, the relay of aircraft position reports, pilot reports of significant weather encountered, requests for changes to flight plans, and furnishing airport advisory information. Also included as an aircraft contacted is the relay of a departure clearance or air traffic control instructions via telephone, teletype or interphone. The intent is to credit one count per flight service station for each different aircraft contacted, regardless of the number subsequent contacts made with the same aircraft during the same flight, i.e., from the time taxiing is begun through the time the aircraft is airborne and until it has landed and parked.

To derive the level of flight service activity the following formulae should be used.

-- Flight service stations concerned solely with domestic flights (including transborder flights to Canada or Mexico) should compute their level of activity by taking the number of pilot briefings (multiplied by two) plus the number of aircraft contacted.

-- For flight service stations concerned solely with international flights the formula two times pilot briefings plus two times the aircraft contacted should be used.

-- For flight service stations responsible for both domestic and international flights (designated as FSS/IFSS) the basic formula of two times the pilot briefs is used. For the international portion of their operations, the aircraft contacted count is multiplied by two. For their domestic flights a single count is taken for each different aircraft contacted.

The definitions of creditable volume elements and their treatment in deriving the level of flight service activity have been developed specifically for use in evaluating positions under this part. The definitions and methodology provided are sufficiently flexible to accommodate to all flight service operating situations. It is intended that users will adhere strictly to the criteria provided for determining the level of flight service activity.

It is recognized that future expansion of flight service programs or technological changes in the work may well require alteration in the definition of creditable volume elements; in the methodology for deriving the total volume; and in the volume ranges associated with each of the grade levels. Using agencies, in their reviews of the application of this part to the various flight service work situations, should assess the continued validity of these criteria and, where

indicated, recommend appropriate adjustments to the Civil Service Commission.

The different weights used in the flight service activity formulae reflect consideration of the nature of these tasks in various work situations, and the relative difficulty involved in their performance. The double weight assigned pilot briefings provides, overall, the appropriate credit for the most demanding task in terms of the skills, abilities and judgments required. This weight also reflects credit for the responsibility inherent in providing to the pilot sufficient information on which to base a decision that could ultimately affect life and property.

As noted earlier, the aircraft contacted count reflects a variety of situations ranging from the exchange of routine information to assisting pilots in emergency situations. Because of this wide variation in difficulty the aircraft contacted count is unweighted in the volume formula applicable to domestic flight operations. By way of contrast, international flight operations frequently involve additional responsibilities such as over-water tracking of aircraft, and require additional knowledge of International Civil Aviation Organization procedures and pertinent air traffic rules and procedures of the destination country. For these reasons the aircraft contacted count in international flight operations is assigned an additional weight.

The level of flight service activity factor is illustrated in the grade level descriptions in terms of the annual volume of flight services typically associated with each grade. In addition, an alternative criterion expressed in terms of a minimum level of pilot briefing characteristic of each of the grade levels has been provided. This alternative is specifically intended for use in evaluating positions which may not precisely meet a particular level of flight service activity, but which are considered nonetheless to be equivalent to that level in terms of difficulty and complexity. The intent here is to avoid excessive reliance on use of a single measure, and to provide additional guidance for evaluating atypical positions.

The *work situation* factor considers a number of key environmental and operational characteristics of each station's flight plan area which have the most direct and tangible influence on the difficulty of flight service work assignments. The influence of these characteristics is discussed in detail in the section titled ANALYSIS OF CLASSIFICATION FACTORS.

In the grade level descriptions the work situation factors are treated largely in narrative and conceptual terms. Where feasible, the narrative descriptions of these factors are further illustrated by reference to specific quantities, such as the number of general aviation aircraft based in the flight plan area. The intent here is to further demonstrate the relationship of these work situation factors to the level of flight services provided.

It is not intended that all of the quantitative and qualitative aspects of each work situation characteristic described must be met before a particular grade level may be assigned. Overall, flight service stations reflect a wide range of operational requirements, and seldom will any individual station reflect precisely all of the work situation characteristics for a given grade level.

Therefore, determinations as to the appropriate level for this factor should be based on consideration of the total work situation characteristics described at each grade, rather than the presence or absence of any individual characteristic.

Users should bear in mind that the work situation factor is described in terms of the more typical or normal characteristics. In some few instances this may not accurately reflect the actual demand for flight services and assistance. For example, for certain stations located along heavily traveled airways the number of aircraft based in the flight plan area may not always reflect the demand for services provided to en route aircraft. Similarly, the number of assigned airports, by itself, does not provide a sufficient basis for distinguishing grade levels absent consideration of the actual demand for services generated by aircraft using those airports.

The descriptions of work situation characteristics are so drawn that users should encounter few problems, when that factor is properly considered in conjunction with the level of flight service activity. In those few instances where a flight service station may appear borderline in terms of evaluating the work situation factor, it is appropriate to base the final grade determination on the level of flight service activity.

USE OF PART I

Part I is used to evaluate nonsupervisory positions in domestic, international, and combined domestic/international flight service stations. It is also used, in conjunction with Part II of this standard, to evaluate nonsupervisory positions in combined flight service/terminal facilities.

Work assignments in this specialization typically involve performance, on a rotational basis, of the duties of all positions of operation within each flight service station. Thus, each full performance specialist maintains proficiency in all functional areas, and regularly performs work characteristic of the most difficult positions. Because of the rotational assignments the individual positions of operation are not treated specifically in the grade level descriptions. Instead, this part is geared to evaluate the full scope of the work performed, and for most stations this leads to the use of a single grade for all full performance level specialists. For the majority of cases this should cause no problems, and the level of flight service activity and work situation factors may be evaluated on a station-wide basis, provided that all full performance level specialists are subject to the full work rotation program.

Flight service stations which provide En Route Flight Advisory Service (EFAS) may represent an exception to the rule of evaluation on a station-wide basis, since these stations do not typically have a full rotational assignment program. In most instances, the EFAS duties are performed only by those specialists who have the additional training required. In this and any other similar situation, positions should be evaluated individually on the basis of the duties actually performed. With respect to determining the level of flight service activity, for example, that portion of the

pilot briefing and the aircraft contacted counts derived from EFAS activity may not be credited to positions which do not perform EFAS functions. On the other hand, EFAS positions may be credited with the total volume handled by the station since they normally rotate in working all positions of operation within these stations.

The grade level descriptions in this part, with the exception of GS-5 and GS-7, do not describe all of the possible combinations of work and developmental assignments at each of the less than full performance grade levels. For guidance on the treatment of developmental positions, users should consult the section titled OCCUPATIONAL INFORMATION, which precedes Part I.

Preventing unwarranted grade fluctuations. The intent of this standard is to avoid changes in grade levels on the basis of minor or temporary variations in the work. Of the two elements considered in this part, level of flight service activity may be more susceptible to frequent fluctuation due to such factors as seasonal variations in aviation activity, temporary fuel shortages, or airport construction and alteration. On the other hand, a change in work situation factors, such as the reconfiguration of a station's flight plan area altering the number of airports and pilots served, may significantly and permanently influence the work performed. In view of the close relationship between work situation factors and level of flight service activity, a measure of grade level stability may be achieved by careful consideration of both of these factors with respect to their long term trends and the probable permanency of any change. The following procedures are to be observed to insure that grade changes are made only where appropriate.

Raising grade levels. Where upgradings appear warranted due to a station meeting the required level of flight service activity, users should first determine the reason(s) for the increase, the impact on the work of the specialists and the probable permanency of the change.
In this regard, analyses of past activity and projections of anticipated demand for services should be used to determine the impact on the difficulty of the work performed. Such analyses and projections should cover a reasonable period (e.g., 18 months) to minimize the influence of any seasonal variations and clearly indicate the long term trend for both factors. If the results of these analyses indicate that the changes in the work are significant and are likely to be permanent the grade changes should be accomplished promptly. If, on the other hand the changes are only temporary and activity will not likely be maintained at the higher level, the grade level changes should not be made.
Lowering grade levels. The same general considerations for raising grade levels should be applied to those instances where it appears that lower grades are appropriate, i.e., the determination should be based on analysis of the long term trends and probable permanency of changes in work situation factors and level of activity. To avoid precipitous grade adjustments, a buffer concept should be utilized whereby stations whose level of flight service activity fluctuates no more than five percent below the ranges cited for either the total services provided or pilot briefings should be considered borderline and retained in grade. Grade levels should be retained where the analyses described above indicate that the station's level of flight service activity will remain within

the buffer zone for either of these measures. However, where the analyses clearly indicate that lower grade levels are warranted, action to effect these changes should be initiated.

GRADE LEVELS

AIR TRAFFIC CONTROL SPECIALIST (STATION), GS-2152-05

This is a trainee level for flight service specialists, designed to train them for work assignments characteristic of higher levels. The GS-5 specialist receives classroom and on-the-job training in various flight service functions and in the various kinds of work performed in stations. As training progresses and specialists become more familiar with the equipment and station procedures they perform some of the basic station duties such as operating basic communication equipment, sequencing and filing flight plans, or answering requests for specific information which may be determined by reference to standard manuals or handbooks.

The GS-5 employee is under direct supervision. Higher level specialists observe the work on a continuing basis to insure proper performance of tasks and to provide training in basic flight service skills.

AIR TRAFFIC CONTROL SPECIALIST (STATION), GS-2152-07

GS-7 is a developmental level for flight service work. Specialists who enter at GS-7 receive training in the full range of flight service functions, and in addition, perform some of the basic operating tasks.

GS-7 flight service specialists perform such duties as: briefing pilots (under very close supervision and guidance); receiving and relaying military and civilian flight plans; relaying information to centers and terminals; taking weather observations; transmitting weather reports; and making scheduled broadcasts on station radio outlets.

Initially the GS-7 specialist is under direct supervision. As the GS-7 specialists progress through training, they work at routine assignments with more independence than the GS-5. On more difficult assignments, e.g., tasks that would otherwise be characteristic of the GS-9 level, they are supervised on a continuing basis and evaluated in terms of their potential to perform those tasks with greater independence.

AIR TRAFFIC CONTROL SPECIALIST (STATION), GS-2152-09

GS-9 is the first level of independent performance of flight service assignments in stations which have the characteristics described below. The full performance level GS-9 flight service specialist

performs, under general supervision, the duties of all positions of operation within the assigned flight service station. This level is distinguished from the next lower level by full responsibility for independent performance of the most difficult flight service tasks -- preflight pilot briefing, and maintaining communications with and providing assistance to en route aircraft. GS-7 specialists, on the other hand, are in a developmental stage with respect to performance of the more difficult tasks, and perform independently on only those positions of operation for which they have successfully completed the training and position qualification.

Also included at this level, but not specifically described, are advanced developmental positions in flight service stations where the full performance level specialist positions are evaluated at a higher grade.

Work Situation

Flight service stations at this level generally provide a full range of services including: preflight pilot briefing; maintaining communications with and providing assistance to en route aircraft; accepting and processing flight planning information; monitoring the operation of radio navigational aids; broadcasting weather information and storm advisories; and developing and disseminating information related to significant aeronautical conditions within their assigned area, e.g., notices concerning the operational status of radio navigational aids. At selected locations, GS-9 flight service specialists make and report scheduled weather observations, and advise Customs and Immigration services of trans-border flights.

Flight service stations at this level which are located at airports not served by an air traffic control tower (or during periods when the tower is closed) provide advisory services to aircraft using that airport. Such services include furnishing to arriving and departing aircraft winds and altimeter information, favored or designated runway and general location of known air traffic in the airport area. At some locations, the GS-9 specialists operate radio direction finding equipment to assist pilots who are lost or experiencing some type of in-flight emergency to a safe landing area.

The GS-9 level includes a range of flight service work situations. At the lower end of this range are those stations which are operated from eight to sixteen hours per day, and which primarily serve pilots at the airport where the station is located and other airports within the immediate vicinity of the station, e.g., within the local telephone dialing area. Also included at this level are those stations which operate the full twenty four hours, and whose flight plan area may include several (e.g., 5 to 12) public-use airports.

Flight service stations at this level primarily serve general aviation (private) pilots from the local area. At some locations, the station may also provide service to one or more military installations. General aviation aircraft based at public-use airports within the flight plan area range approximately from one to three hundred. Flight activity at the airports served is relatively light, e.g. generally less than 200,000 general aviation aircraft operations annually for all of the airports

served. Few of these airports have traffic activity levels such as to require the services of an air traffic control terminal.

Level of Flight Service Activity

The demand for flight services at this level is characterized as being light to moderate. GS-9 flight service stations provide up to (but not including) 75,000 total services annually. Also typical of this level are those stations which provide less than 25,000 pilot briefings per year.

AIR TRAFFIC CONTROL SPECIALIST (STATION), GS-2152-10

GS-10 represents an intermediate level of difficulty for full performance flight service work assignments. This level of difficulty is characterized by the requirement to provide significantly higher levels of service to pilots, both prior to and during flight, in work situations which overall impose additional knowledge and performance requirements on the individual specialist when compared with work assignments at the next lower grade.

Work Situation

Flight service stations at the GS-10 level typically operate on a full twenty-four hour work schedule to provide a range of preflight services and assistance to in-flight aircraft similar to that provided by stations at the next lower level. In addition, a number of stations at this level utilize weather radar equipment (remoted from the National Weather Service's primary radar) to detect and display the location, intensity and movement of significant weather activity. The real-time weather information provided by the radar is used in the preflight briefing of pilots and to provide weather advisories to in-flight aircraft. At these locations the specialists must be knowledgeable in the operation and adjustment of the radar equipment and have the ability to interpret radar displays, particularly with respect to the location and movement of weather systems which might pose a threat to aircraft.

A number of stations at this level are responsible for providing En Route Flight Advisory Service (EFAS) to airborne aircraft in their assigned geographic area.

For flight service stations at this level, flight plan area characteristics are similar to those of stations at the GS-9 level. However, higher activity GS-10 stations may have responsibility for providing service to twenty-five or more public-use airports. Similarly, for the higher activity stations, the number of general aviation aircraft based at these airports may range up to eight hundred.

Level of Flight Service Activity

GS-10 stations provide levels of service ranging from medium through heavy. These stations annually provide from 75,000 up to (but not including) 300,000 total services. Also included at this level are those stations which provide at least 25,000 but less than 125,000 pilot briefings per year.

AIR TRAFFIC CONTROL SPECIALIST (STATION), GS-2152-11

The GS-11 level includes positions at those flight service stations where especially demanding conditions exist in terms of the very highest levels of services that must be provided and the increased demands imposed by the environmental and operational characteristics of the area served by the flight service station.

The GS-11 level involves the most difficult and complex flight service work assignments. When compared to assignments at lower grades, the work at this level is more demanding due both to the substantially larger general aviation populations served and the higher level of demands on the skills, abilities and judgments of the individual specialist imposed by such factors as: the increased number of very high activity airports served; the additional local operating procedures which must be observed; the increased coordination required with the air traffic control facilities in the area; and the greater exposure to varied aviation interests, e.g., flying clubs, student pilots, transient flights, etc.

Work Situation

Flight service stations at the GS-11 level provide the full range of preflight and in-flight services similar to that provided by stations at GS-10. At a number of locations this includes providing En Route Flight Advisory Service to airborne aircraft. However, because they are typically located at airports which have an air traffic control terminal that is operational sixteen or more hours per day, few stations at this level provide the amount of airport advisory service characteristic of the lower level stations. On the other hand, because of the very high demand for pre-flight weather and aeronautical information, stations at this level generally employ a greater variety of techniques and equipment to dispense general weather information and pre-recorded route briefings, and to expedite the handling of flight plan data, thus to some extent relieving specialists of the more routine requests for service.

Flight service stations at this level typically serve major metropolitan areas having the highest levels of commercial, military and general aviation activity. This very high level of activity in turn generates a demand for flight services and assistance which is substantially greater than demands imposed on stations at the next lower grade. For example, GS-11 stations typically have from one to three thousand general aviation aircraft based within their flight plan area. In addition, the stations proximity to the major metropolitan area, or their location along heavily traveled airways, generates substantial amounts of itinerant business, industrial, and general aviation activity. This

level of activity is further illustrated by stations where the associated airports (combined) typically handle in excess of one million general aviation aircraft operations annually. Several of the airports involved (e.g., 3 or more) handle sufficient volumes of traffic to warrant the services of an air traffic control terminal.

Level of Flight Service Activity

The demand for flight services at this level is characterized as extremely heavy. GS-11 stations provide 300,000 or more total services, or at least 125,000 pilot briefings per year.

PART II -- AIR TRAFFIC CONTROL SPECIALIST (TERMINAL)

The duties, responsibilities, and qualifications required to control air traffic in terminals vary according to the type of aircraft operation (i.e. visual or instrument flight rules) and whether radar is used.

Visual Flight Rules Control

Pilots operating aircraft under visual flight rules (VFR) procedures assume responsibility to "see and be seen" and thus maintain their own separation from other aircraft. Controllers handling VFR aircraft rely on radio contact with the pilot and observation of aircraft movements in the airport traffic area as the basis for issuing control instructions to pilots. The controller is responsible for issuing clearances and traffic information to aircraft landing, departing or operating within the airport traffic area. The controller must have a knowledge of the flight and performance characteristics of a wide variety of aircraft, aircraft separation standards, and the skill and ability to keep air traffic properly separated on the runways and in the air.

Instrument Flight Rules Control

Pilots operating aircraft under instrument flight rules (IFR) rely on air traffic control to provide separation from other aircraft. Control of instrument traffic may be accomplished with or without the use of radar. In addition to the duties, responsibilities, and qualifications required in the control of visual flight rules traffic, the control of instrument flight rules traffic involves:

-- The use of information received from the center and from aircraft in flight regarding speed, altitude, and estimated and actual times over radio fixes, and a knowledge of airport capacity as a basis for determining whether to instruct aircraft to change altitude, hold at a radio fix, proceed to immediate landing, or take other specific action;

-- Determining the number of altitudes to be used at one or more holding fixes;

-- Directing aircraft from one altitude to another or from one radio fix to another to maintain safe and simultaneous movement; and

-- Determining the time and sequence of IFR aircraft movements to avoid conflicts between inbound, departing, and other traffic within the area under the control of the terminal.

Radar Control

To control traffic using radar, the controller must possess and apply additional knowledge, skills and techniques. For this type of control, the controllers use radarscopes equipped with overlays or video mapping which depict runways, navigational aids, airspace boundaries, topographic features and other data pertinent to the control situation. By observation of aircraft on the radarscope in relation to these features, the controller issues very precise instructions to the pilot as to what headings to fly, when to ascend, descend or turn, and at what speed and altitude to fly. By continuously issuing instructions to pilots, the controller exercises a very positive and continuing control over each aircraft within the assigned airspace.

Because of this positive and continuing control, the use of radar permits reduced separation among aircraft. The lesser separation requirements, however, increase the need for rapid and precise decisions. The radar controller must determine the exact moment for directing approach turns or directing aircraft away from other traffic; must carefully consider the effects of such factors as wind, weather and aircraft capabilities to determine the proper sequence of operations; and must mentally retain the identity of a number of aircraft and their projected movements within the assigned airspace.

CATEGORIES OF TERMINALS

Air traffic control terminals are differentiated into four major categories on the basis of the primary type of control services provided.

-- *Non-approach control terminal*. This type of terminal handles primarily aircraft operating under visual flight rules. These terminals are located at those airports where the principal user category is general aviation aircraft. Although some of these airports may have significant amounts of other user categories such as military or air carrier, the great majority of the traffic is generated by general aviation flying. Controllers in the non-approach control terminals are responsible only for air traffic at or in the immediate vicinity of the airport on which the terminal is located. At some of these terminals, televised displays of the parent approach control facility's radar (i.e., BRITE) may be used to supplement visual observations, to aid in sequencing traffic and to provide air traffic advisories.

-- *Nonradar approach control terminal*. In addition to handling aircraft operating under visual flight rules, this type of terminal also provides (without the use of radar) approach and departure control services to aircraft operating under instrument flight rules. This type of terminal is located at airports with user categories similar to non-approach control airports. In addition to providing air traffic control for the airport at which the tower is located, this type of terminal frequently controls traffic operating to and from one or more adjacent non-approach control airports.

-- *Limited radar approach terminal*. This type of terminal provides radar approach control service to VFR and IFR aircraft operating within delegated airspace in the immediate vicinity of the airport, utilizing televised displays of the parent approach control facility's radar (BRITE). Limited radar approach control terminals are distinguished from those non-approach control terminals which may also use BRITE displays by the specific delegation of airspace by the parent approach control facility, and the provision of approach control services in the immediate vicinity of the airport. Non-approach control terminals, on the other hand, use the BRITE display to supplement visual observations, to aid in sequencing traffic and to provide air traffic advisories, and are not delegated control of airspace.

-- *Radar approach control terminal*. This type of terminal provides radar control of aircraft operating to or from the primary airport and frequently adjacent airports, and the control of aircraft transiting the area under the control of the terminal. Airports served by this category of terminals include major air carrier airports as well as airports with significant amounts of traffic in other user categories.

In contrast with other categories of terminals, radar approach control terminals are divided into two functional units, the radar or IFR room and the tower cab. Generally these two units are both located within the same terminal facility, with controllers alternately performing radar control and tower cab duties. However, in some few instances the radar room and tower cab are separate facilities, and controllers do not rotate between the two units. In some locations the radar service for a number of adjacent airports is provided from a combined or common radar room facility.

At some few locations non-approach control terminals or nonradar approach control terminals are combined with flight service stations. At these combined facilities employees perform both the terminal control and flight service duties.

ANALYSIS OF CLASSIFICATION FACTORS

Air traffic control positions in terminals, above the trainee and developmental levels, are differentiated primarily by the influence of two factors -- the level and kinds of Knowledges, skills, and abilities required of the controllers, and the Complexity of the control environment.

The influence of these two factors on the duties, responsibilities and the qualifications required of terminal controllers is discussed below and in the grade level descriptions which follow. Also discussed below are those classification factors which have significant impact on the level of difficulty and responsibility of controller positions as a class, but which do not serve to distinguish among the full performance level controller positions. Therefore, these non-distinguishing factors are not discussed to any significant degree in other than the grade level descriptions for trainee and developmental positions.

Knowledges, skills and abilities required

This factor is directly related to the type of control services provided by the terminal, and the various procedures and techniques which the controller must know and apply. For controllers manning non-approach control terminals these include:

-- The procedures and standards for separation and control of aircraft;

-- Pertinent airspace boundaries, operating agreements with other facilities, airport layout, runway and taxiway configuration and capacity, and airport lighting and instrumentation systems;

-- The geographic area surrounding the airport including significant terrain or other features, the adjacent airway and route structures, the location of navigational aids, and the approach patterns;

-- Different models and types of aircraft, their identifying features, and general performance characteristics such as operating speeds and rate of climb;

-- The function and operation of various tower cab equipment such as runway visibility measuring equipment, communications systems, weather instruments, recording equipment, navigational aid monitors, direction finding equipment, and flight data printing devices; and

-- Significant weather conditions that may affect the safety of air operations

In addition to the above knowledges, controllers operating nonradar approach control terminals must have knowledge of and ability to apply the procedures and techniques for controlling air

traffic based upon flight progress information on the speed, altitude and direction of aircraft operating under instrument flight rules.

Controllers in nonradar approach control terminals must be able to maintain a mental picture of the location of the aircraft being controlled, their estimated time over navigational aids and fixes, their estimated arrival in the airport traffic pattern and thus determine the proper sequence for landing and departing aircraft. Controllers in nonradar approach control terminals are frequently required to know the approach pattern and procedures for one or more adjacent non-approach control airports.

Controllers in limited radar approach control terminals, in addition, must have a knowledge of the operating characteristics and parameters for providing limited approach control services using BRITE displays, and the ability to apply IFR separation standards and vectoring procedures.

Controllers in terminal facilities which provide full radar approach control services for air traffic are required to possess (in addition to those knowledges indicated above) a comprehensive knowledge of the operational requirements and techniques for providing radar control and separation of aircraft. Controllers in radar terminals must apply a knowledge of the function and operation of the radar equipment, and its various displays, the adjustment of the equipment, and the ability to detect malfunctions and interferences. In those terminals equipped with automated radar tracking systems, controllers must possess a detailed knowledge of the functions and routines necessary to input or obtain control information from the computerized system.

Complexity of the control environment

The influence of traffic density on complexity. The complexity of controlling air traffic in terminals is influenced most significantly by the demands which the density and congestion of aircraft place on the skills, abilities and judgment of the controller. As the level of air traffic increases significantly there is a proportionally greater increase in the amount of coordination required among the controllers. Decisions on instructions to be issued to pilots become more critical. As the airspace becomes more congested, optional plans for the movement and control of aircraft are reduced. Increased numbers of aircraft require that controllers maintain increased alertness to a highly dynamic traffic picture.

Normally, a significant increase in air traffic requires a proportionally larger staff of controllers. The complexity of the control environment, however, depends on the elements of difficulty associated with the relative congestion of air traffic in each terminal's airspace rather than the number of air traffic controllers available to handle the traffic. Greater congestion of air traffic on a continuing basis places significantly greater demands on the individual controller's judgment, skill, and decision making ability in terms of his capacity to react rapidly and without error in work situations that are often extremely stressful. In a higher density control environment with

more complex configurations of airspace, there is a requirement for more rapid and precise coordination of control actions among the members of the larger staff.

It is the sustained flow of air traffic that is significant, rather than the total volume of traffic handled by a terminal over a specific period. For example, aircraft which are permitted to practice touch-and-go or stop-and-go landings during periods of very light traffic, may contribute significantly to the annual volume of operations handled by that terminal. In actual fact, such operations performed under these conditions have little influence on the overall difficulty and complexity of the control situation.

Therefore, it is not the total volume of control operations that influences the level of difficulty of terminal positions. It is instead the relative density and congestion of air traffic which controllers must handle on a regular and recurring basis that has the most significant influence on the difficulty of these positions.

The specific methods used to measure relative traffic density in the various work situations in the terminals are described in detail in the section titled USE OF PART II.

Influence of other complexity factors. The complexity of terminal controller positions may be further influenced by a number of environmental and operational factors which controllers must deal with in assuring the safe, orderly and expeditious movement of aircraft. Included among these factors are:

-- The varying mix in speed and performance characteristics of aircraft using the airport, or transiting airspace under the control of the terminal;

-- Limitations on the use of airspace imposed by such factors as noise abatement procedures, terrain, proximity of other airports, or the use of restrictive arrival and departure corridors;

-- The airport configuration in terms of runway and taxiway layout, lengths and capacities; and

-- Provision of control services for satellite or secondary airports.

The influence of these factors on the level of difficulty and complexity of individual controller positions is far less tangible than is density of traffic. Virtually all terminals will be found to have these or similar factors of varying kind and intensity associated with the control work. Because of this, these factors by themselves serve no useful purpose in distinguishing among grade levels. Since many of these factors are static in nature and only become dynamic as traffic congestion increases, they are best considered in relation to significant increases in traffic density. For example, the most complex runway configuration poses few or no problems to controllers at terminals with very light traffic. This factor does, however, become significant when substantial

and sustained increases in traffic occur. To the extent possible the relationship between these environmental and operational factors and significant differences in traffic density is discussed in the grade level descriptions. However, rarely, if ever, will any one or a combination of these environmental and operational factors become so significant as to materially affect the grade level of individual positions

Supervisory control

Almost without exception full performance level controller positions in the terminals are characterized by an unusually high degree of independence from supervision, and the responsibility for formulating and executing control decisions which are essentially unreviewed. The nature of air traffic control work is such as to generally preclude the possibility or feasibility of any significant degree of technical review once the controller has qualified on the assigned positions of operation. Technical review consists largely of supervisory assessment of the adequacy with which controllers perform their functions, as well as periodic over-the-shoulder evaluations to gauge the controllers' overall performance parameters. Therefore, since this independence from supervision and responsibility for decisions made is characteristic of almost all full performance level controllers, this factor in and by itself does not serve to make meaningful distinctions among the grade level of individual positions.

Scope and effect of the work

Terminal controllers as a class are responsible for the safe, orderly, and expeditious movement of air traffic. All controllers are intimately and continuously concerned with the safety of flight, and the protection of life and property. Moreover, the safety aspect of control work does not vary among terminals, i.e., there are no gradations or degrees of responsibility for safety that serve to distinguish one terminal from another.

On the other hand, the orderly and expeditious movement of air traffic in situations involving saturation or near saturation of airspace for extended periods, is a distinguishing characteristic. This is particularly true in those terminals where traffic demands are such that the slightest of delays could result in significant bottlenecks not only at that airport, but over large areas of the country. Where applicable, this aspect of the scope and effect of the work is discussed in the grade level descriptions.

Physical and mental demands

For all terminal controller positions there are certain fundamental physical and mental abilities required such as the ability to make rapid and precise judgments in a "real time" work situation, to remain calm under conditions that are often very stressful, to coordinate many different operations, and the ability to adjust rapidly to changes in the patterns and tempo of work activity.

Variations in the intensity of these physical and mental demands are linked both to the type of control services provided and the complexity of the control environment. Because of this direct relationship to traffic density and environmental and operational complexity, no separate treatment of the physical and mental demands has been included in the evaluation criteria.

Nature and purpose of personal contacts

Contacts between terminal controllers and pilots must convey the proper control action and the precise moment that action must occur. Radio transmissions between the controller and the aircraft must be sufficiently detailed to make clear to the pilot what action is required, yet they must be kept brief to reduce radio frequency congestion. The pilots contacted by terminal controllers range from air carrier pilots who fully comprehend and act readily upon control instructions to student or lower proficiency private pilots, many of whom require repeated and detailed explanation of control instructions.

While the difficulty of controller/pilot contacts is influenced both by the total number of contacts required and the problems involved in communicating with pilots who have different skill levels, the most significant (and tangible) factor is the number and pace of the contacts. As the density of traffic increases significantly, there is increased pressure for more rapid, precise and clipped transmissions between controller and pilot. In situations of near saturation of airspace the number of aircraft to be contacted is such that there is literally no time for controllers to repeat or give detailed explanations of control instructions.

USE OF PART II

Part II is intended for use in evaluating nonsupervisory controller positions in the four major categories of air traffic control terminals. Positions in those few combined flight service station and terminal facilities are evaluated against the criteria in this part, and the criteria in Part I of this standard pertaining to Flight Service Stations.

This part is designed for direct application to trainee controller positions, and to all full performance level positions in those terminals which, on a regular basis, rotate controllers through several different positions that are characteristic of the most difficult positions of operation in the facility. Part II is, therefore, designed to evaluate the highest level of control work which all controllers would perform for a significant amount of time. This does not mean that there no longer is a requirement to evaluate individual controller positions. Each individual controller position must still be examined and evaluated on the basis of the criteria in this standard.

Positions which tend to specialize in particular functions or positions of operation and which do not regularly rotate among positions in such a manner as to perform on a regular basis the highest

level of control work typical of that terminal should be evaluated by use of these criteria with due consideration of the grade level relationship of the more specialized function to the highest level of control work in the terminal.

Terminals are categorized in the following grade level descriptions as nonradar (non-approach control and nonradar approach control facilities) and radar terminals (which includes radar approach control facilities and combined IFR rooms), and appropriate evaluation criteria are provided accordingly. Non-approach control terminals, which use BRITE primarily as a visual aid, and which do not have airspace delegated by the parent approach control facility are not discussed separately in the grade level criteria. Positions in these terminals should be evaluated against the criteria provide for non-approach control terminals.

Similarly, because of the very small number of such facilities, limited radar approach control terminals are not discussed in detail in the grade level descriptions. Positions in these facilities may be evaluated by appropriate reference to the criteria provided for radar terminals.

Control work in the terminals is divided into functions or positions of operation which are responsible for such specialized control operations in tower cabs as: the control of aircraft in the air and on the runways, the control of aircraft on the taxiways, or obtaining and communicating flight clearances to pilots. In the radar terminals additional positions of operations are responsible for such functions as radar control of aircraft within an assigned segment of airspace or acceptance of the control of aircraft from other facilities. Although such positions are evaluated by use of this part, they are not discussed individually in the grade level descriptions.

To illustrate the influence of traffic density on terminal staffing, specific numbers or combinations of control positions are cited in the grade level descriptions. It should be emphasized that these are illustrations only, and should not be construed so narrowly as to become the sole basis for determining grade levels of individual positions.

Measurement of traffic density. Traffic density for the various categories of terminals is expressed in the grade level criteria in terms of the average hourly operations handled during the day and evening shifts for each terminal's 183 busiest traffic days of the year.

1. *Operations measured*. Two types of flight operations are used to compute traffic density for terminals. These are generally defined as:

   -- Aircraft (airport) operations. An aircraft arrival at or departure from an airport with air traffic control service. (These include an aircraft take-off or landing, low approach below traffic pattern altitudes, stop-and-go, and touch-and-go operations.

   -- Instrument operations. The arrival at or departure from an airport of an aircraft operating in accordance with an IFR flight plan or the provision of IFR separation from other

aircraft by a terminal traffic control facility. (These include IFR aircraft take-offs, landings, instrument approaches, unplanned missed approaches and IFR operations which transit the terminal's control area.)

Several different types of aircraft flight operations and maneuvers are included within these general definitions. It is not the intent of this standard to specifically identify each of these flight operations which may be included in the above definitions and which would be measured to determine the average hourly operation. The determination that a particular aircraft operation or maneuver meets the general definition of an aircraft or instrument operation is left to agency management.

In measuring operations for the various categories of terminals the following rules should be observed:

-- For non-approach control terminals (including those terminals equipped with BRITE which do not meet the definition for limited radar approach control facilities) only the aircraft (airport) operations should be used;

-- For nonradar approach control terminals both the aircraft (airport) operations and the instrument operations should be measured (i.e., the average hourly instrument operations plus the average hourly aircraft operations). This composite of aircraft and instrument operations will result in some dual counting of instrument operations also as aircraft or airport operations. The net effect of this dual credit is a greater weighting of the instrument operations which are generally acknowledged to be the more difficult control operations for this category of terminals;

-- For limited radar approach control terminals the total instrument operations handled by the tower cab positions should be used to compute traffic density;

-- Traffic density for radar approach control terminals (including combined facilities which provide radar service to a number of airports e.g., common IFR rooms) should be based on the facility's total instrument operations count.

2. *Segment of the work cycle measured*. With very few exceptions, terminals experience their heaviest traffic during the day and evening shift hours (i.e., generally during the period from 7:00 a.m. to 11:00 p.m.) with operations declining sharply during the very late evening and early morning hours. Similarly air traffic operations at individual terminals vary from day-to-day and during different seasons of the year. For example, non-approach control terminals generally experience their heaviest traffic during weekends in the summer, and their lightest traffic on weekdays and during the winter months.

To eliminate these daily and seasonal variances in traffic demand, the average hourly operations should be computed using the 183 busiest traffic days of the year since these represent the most difficult work situations. (For nonradar approach control terminals both the 183 busiest instrument operations days and the 183 busiest aircraft operations days are used.)

3. *Deriving the average hourly operations count.* To compute the average hourly operations, the sum total of the operations handled on the top 183 traffic days is divided by 183 to derive an average daily operations count. The daily average operations count is then divided by 16 for those terminals which are open from 16 to 24 hours, or by the actual number of hours the terminals are open for those facilities which are operated less than 16 hours a day. In those rare circumstances where a terminal is open more than 16 hours a day, but where as a regular operating procedure there is a period of less than 16 hours during which the terminal is open to receive all types of air traffic that it is equipped to handle, the daily average operations count is to be divided by the actual number of hours the terminal is open to all traffic.

4. *Preventing unwarranted grade level fluctuations*. In computing average hourly traffic densities, every effort should be made to avoid frequent fluctuations in grade level which may be caused by minor or temporary increases or losses in traffic activity. For example, runway closures, new construction at an airport, or labor disputes in the aviation industry may well have an impact on a terminal's level of traffic to the extent that the average hourly operations count is affected and grade level changes may appear warranted. Similarly, an extremely large number of flight operations handled during a brief air show or some other special event may significantly increase the average hourly operations count.

While it is the intent of this standard to minimize unwarranted grade level fluctuations caused by minor or temporary shifts in traffic activity, no precise formula can be given for dealing with the many situations where these sudden shifts in traffic may impact the traffic density measure. The adjustment of a facility's flight operations count to compensate for these and similar kinds of situations should be a matter of judgment based on experience as to what constitutes both a reasonable and normal traffic workload for the particular terminal.

On an overall basis traffic activity will change for a variety of reasons and a measure of stability may be achieved, and unwarranted grade level fluctuation avoided, by delaying action to change controller grade levels until the probable permanency of the change in traffic density can be established. The following procedures are to be observed to insure that grade changes are made only where appropriate.

Raising facility grade levels. When a terminal's average hourly operations count indicates that positions may warrant upgrading, a projection should be made of that facility's anticipated traffic activity for a reasonable and representative period (e.g., 18 months.) If this projection, based on past experience plus anticipated changes in traffic activity, shows that the facility activity will

remain at or above that hourly traffic density figure, action to change the grade levels should be accomplished promptly. If on the other hand the traffic projection indicates that the facility's activity is unlikely to remain at or above the hourly density figure the grade level changes should not be made.

Lowering facility grade levels. Where decreases in the average hourly operations indicate that lowered grade levels might be warranted, a buffer zone concept should be utilized to prevent precipitous grade adjustment, i.e., average operations which fluctuate no more than five percent below the minimum number of operations for a particular grade should be considered borderline and retained in grade. The same type of traffic activity projection, as described above, should be utilized to establish the probable permanency of the change. Every effort should be made to retain grade levels where projections indicate that the facility would at least maintain a level of traffic activity which would place it within the buffer zone. However, where traffic projections clearly indicate that the level of activity will remain below the buffer zone, action to change positions to lower grade is appropriate.

GRADE LEVELS

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-05

This is a trainee level for terminal controllers. The GS-5 learns to apply a basic knowledge of: air traffic rules; airport traffic control; communications operating procedures, rules and regulations; flight assistance service procedures; air navigation; aids to air navigation; aviation weather; landmarks, terrain, navigational aids and airway structure in the local area; and basic facility equipment.

The GS-5 employee is under direct supervision. Higher level controllers observe the work on a continuing basis to insure proper performance of tasks and to provide training in basic controller skills.

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-07

This is a developmental level for terminal work. Terminal controllers who enter at GS-7 receive training in the subjects described at GS-5 and, in addition, perform some of the basic operating tasks required in terminals.

Work performed at the GS-7 level includes such tasks as: preparing flight progress strips; operating flight data printers; relaying flight plans and arrival reports; obtaining clearances for instrument flights and entering them on flight progress strips; reporting arrival and departure time of instrument flights and relaying clearances, instructions, and advice to aircraft.

Initially the GS-7 controller is under direct supervision. As GS-7 controllers progress through training, they work at routine assignments with more independence than the GS-5 controller. On more difficult assignments, e.g., tasks that would otherwise be characteristic of the GS-9 level, they are supervised on a continuing basis and evaluated in terms of their potential to perform those tasks with greater independence.

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-09

This is an advanced developmental level in terminals. GS-9 terminal controllers, under close supervision and guidance, assist controllers of higher grade in the performance of their duties. For example, GS-9 terminal controllers issue instructions to aircraft and vehicles on all parts of the airport except the runways in use. They issue taxi instructions, and relay departure clearances from the center to the terminal controller and to the pilot. They determine when aircraft and ground vehicles may safely cross active runways and issue instructions to avoid collision between vehicles and aircraft.

At the outset of each assignment to a new kind of work, the GS-9 receives close supervision and guidance. As the GS-9 controller completes various phases of the developmental program, the work is spot-checked, and the GS-9 works with more independence than the GS-7 controller. GS-9 controllers are evaluated both on performance as a GS-9 and on their potential for progression to higher levels.

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-10

GS-10 is the first level of independent performance of all control functions in non-approach and nonradar approach control terminals. As a regular duty the GS-10 terminal controller performs, under general supervision the duties of all positions of operation in the terminal, issuing control instructions to aircraft operating under visual or instrument flight rules or combinations of both.

In contrast, controllers at the GS-9 level (whether in nonradar or radar terminals) are in an advanced stage of the developmental program. GS-9 controllers perform tasks and assignments in direct assistance to higher grade controllers, or perform under general supervision a limited number of the less difficult control functions such as clearance delivery, flight data, or ground control.

Knowledges, skills, and abilities required. In issuing instructions to aircraft operating under visual flight rules the GS-10 controller considers such factors as: position (both present and projected), speed, and direction of aircraft movement; performance characteristics of the aircraft being controlled (e.g., operating speed, rate of climb, and landing speed); and the runway(s) available for use. On the basis of these factors the controller determines: the order of departure that assures all aircraft equitable treatment; the time and direction of take-off and any necessary departure turns; the most efficient sequence of arrivals; the runway in use; and possible simultaneous use of other runways.

In issuing instructions to aircraft operating under instrument flight rules, the GS-10 controller must know the location and type of air navigational aids in reference to the position of the aircraft being controlled. Combining this knowledge with information from the pilots and other air traffic facilities, the controller determines the time and sequence of aircraft movement to maintain separation among arriving and departing aircraft; and issues instructions to pilots to change altitude or course, to proceed from one radio fix to another, or to land.

Complexity of the control environment. At the GS-10 level the control of either visual or flight rules traffic is complicated by such factors as a mix of aircraft with different operating speeds and characteristics; various combinations of student and experienced pilots; unfavorable terrain or other limitations such as noise avoidance areas; and the use of various combinations of converging, crossing or parallel runways.

At this level, traffic demands on the terminal are such that the controllers may perform at the same time more than one function or position of operation (e.g., the ground control and flight data position) for many of the shift hours. Extensive or complicated local procedures, beyond standard

air traffic control procedures, are generally not required to handle the traffic present. Coordination among controllers performing different control functions is readily achieved without resort to intricate or complex procedures. Controller/pilot contacts occur at a moderate pace, generally allowing adequate time to relay instructions and coordinate control actions with other aircraft.

Traffic demands at the GS-10 level are characterized by a light to medium density of traffic. Rarely is there a requirement to handle on a recurring basis a heavy density of traffic. At this level, non-approach control terminals during the day and evening shifts typically handle an average of up to 34 aircraft operations per hour.

Nonradar approach control terminals at the GS-10 level regularly handle average traffic densities ranging up to 24 aircraft and instrument operations per hour during these same shifts.

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-11

This level includes a variety of assignments and work situations in the terminals. GS-11 is typically the first full performance level of control work in radar approach control terminals. Also included at this level are full performance level control positions in non-approach control and nonradar approach control terminals where the performance requirements are substantially higher than at the GS-10 level.

Knowledge, skills, and abilities required.

Nonradar terminals.

The kind of knowledges required at this level are similar to those typical of the GS-10 level. However, the skills, abilities and judgments required of the GS-11 controller are significantly influenced by the greater density of traffic which must be handled on a regular basis.

The GS-11 controller must issue very exact and precise instructions in more complex (i.e., more heavily congested) control situations within more restrictive time allowances. More often than the GS-10 controller, the GS-11 must make such decisions as whether to land or circle arriving traffic and whether intervals between aircraft should be shortened or lengthened to assure adequate separation and the efficient movement of traffic. The increased complexity of the control environment imposes for the GS-11 problems of greater difficulty in the sequencing and spacing of aircraft, and greater complexity in determining the proper movements and course instructions, often accompanied by the need to amend instructions to numerous aircraft to avoid disrupting the traffic pattern. At this level more precise and frequent coordination with the pilots and the other controllers is typically required than at the next lower level.

Radar terminals. GS-11 is the first level of independent performance of all control functions in radar terminals. Radar control of air traffic is more difficult than the nonradar control described at GS-10 because it requires, in addition to the detailed knowledge of nonradar air traffic control typical of this and lower levels, a thorough knowledge of the functions and interference characteristics of radar systems; knowledge of and the ability to apply the reduced aircraft separation standards possible under radar, and the requirement to maintain a more positive and continuing control of aircraft.

Complexity of the control environment.

Nonradar terminals. At this level traffic demands are such that the full range of positions of operation (local control, ground control, approach control, clearance delivery and flight data) are manned on a full or substantially full-time basis during day and evening shift hours. This is in contrast to the GS-10 level where traffic density is such that positions of operation are frequently combined for several hours during these shifts. Because of the increased number of operating positions and the increased congestion of traffic a significantly greater amount of coordination is required both within the terminal itself and with other air traffic facilities. Contacts with pilots are more frequent than at the GS-10 level.

Formulating and issuing instructions requires more rapid and precise analysis of the effect of any specific instruction on more numerous aircraft than are characteristic of the GS-10 level. At this level a larger number of local procedures must be developed to safely and effectively deal with the traffic demands placed on the terminal.

Complicating environment and operational factors similar to those described at GS-10 are present in the GS-11 control environment. However, the difficulties imposed by such factors as close proximity of other airports, mix of student and experienced pilots, and crossing or converging runways are intensified by the recurring heavy density of traffic typical at this level.

Traffic demands at the GS-11 level are characterized by a heavy density and congestion of traffic. Aircraft operations at non-approach control terminals during day and evening shift hours typically average from 35 to 89 operations per hour. Nonradar approach control terminals at this level average from 25 to 79 aircraft and instrument operations during these same shifts.

Radar terminals. Radar terminals at the GS-11 level typically require only a limited number (i.e., 2 to 3) of radar positions of operation, although some facilities may have larger number of radar positions established, but not operated during several hours of the day and evening shifts.

Traffic demands are such that individual radar positions may handle more than one control function (e.g., both arrivals and departures) or assume responsibility for a relatively large segment of the terminal's assigned airspace. Radar terminals at this level typically have fewer and less

complex configurations of airspace than terminal control situations at higher levels. As a result, coordination for the use of airspace is more readily achieved at this level.

Complicating environmental and operational factors such as the presence of satellite airports, crossing or converging runways, tower en route operations, unfavorable terrain, and restricted areas are common at this level.

Instrument operations for radar approach control terminals at this level are characterized as light to medium densities of traffic, and regularly range up to 19 per hour (average) during the day and evening shifts.

Limited Radar Terminals. Limited radar approach control terminals typically handle up to 24 instrument operations hourly (average) during day and evening shift hours.

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-12

The GS-12 level is characterized by exceptionally difficult and complex nonradar work situations in the non-approach control and nonradar approach control terminals. Also included at this level are full performance control positions in radar approach control terminals where the performance requirements substantially exceed those required for radar control work at the GS-11 level.

Knowledges, skills and abilities required.

Nonradar terminals. This level is distinguished from GS-11 by the significantly higher level of skills, abilities and judgments required in regularly, and for sustained periods, handling an extremely heavy density of traffic. In the GS-12 nonradar terminal environment this much higher level of skills and abilities is required because of:

-- Continuous or near continuous communications between pilots and controller for extended periods;

-- Rapid and precise coordination of control actions among controllers and with air traffic facilities;

-- Increased number of aircraft positions, directions and speeds which must be assimilated and mentally updated with the rapid changes occurring in the traffic pattern;

-- Requirements for split second analysis of the traffic situation, and rapid and precise decision making; and

-- Frequent to constant use of all known procedures to expedite traffic.

The requirement for controlling an extremely heavy density of traffic for sustained periods results in the GS-12 controller facing a constantly changing pattern of traffic which presents more difficult sequencing and separation problems than the GS-11. In this situation a control instruction to one aircraft nearly always requires amending instructions to several aircraft to maintain adequate separation and expedite the flow of traffic. The GS-12 nonradar controller in this situation must consider many more alternatives than the GS-11, i.e., the more numerous effects which might result from a single control decision in the extremely congested GS-12 control environment require a more considered and faster analysis than is required at GS-11.

Radar terminals. At this level, the kinds of knowledges, skills and abilities are similar to the next lower level. However, in comparison with the GS-11 radar controller who typically handles a light to medium density of traffic, the GS-12 controller is faced regularly with peaks of heavy traffic. Under the more restrictive time and space limitations imposed by the greater density of traffic there is the requirement for greater precision in determining appropriate aircraft movements and formulating control instructions; more intense and precise coordination among the controllers; consideration of the effect of action by any specific aircraft on a larger number of other aircraft in the terminal airspace; and consideration of a larger number of more rapidly changing aircraft positions and a greater variety of alternative actions for individual aircraft. During the recurring heavy density periods typical of this level the GS-12 coordinates control actions with other controllers and issues instructions to pilots almost simultaneously. Often this type of terminal provides radar service to a number of satellite airports. The difficulties imposed by such factors as the need to possess and apply knowledge of numerous procedures and airport configurations, procedures for satellite airports, noise abatement procedures and complex runway problems are substantially intensified by the heavy densities of traffic characteristic of GS-12 radar control.

Complexity of the control environment.

Nonradar terminals. Traffic demands are such that not only do the individual positions of operation become more specialized but frequently additional positions of operation must be established to handle the traffic which is present. For example, non-approach control terminals at this level may divide the local control function along the configuration of the airport into two or more positions of operation. In these situations more complex intra-terminal procedures are required than at the GS-11 level, and coordination of control actions becomes a critical aspect of the work.

The extremely dense and congested traffic patterns result in few if any extended lulls in operations, and peak traffic hours tend to overlap. Controllers in this situation work under the most stressful of conditions for extended periods.

The difficulties imposed by combinations of such factors as noise abatement procedures, mixtures of experienced and student pilots, high level of pilot training, natural terrain obstructions, and

mixtures of aircraft with widely varying speeds are substantially intensified by the sustained periods of extremely heavy traffic characteristic of GS-12 nonradar work.

Few non-approach control terminals will meet this level. Typically these are terminals which handle 90 or more aircraft operations hourly during day and evening shift periods. Similarly, few nonradar approach control terminals are likely to handle the 80 or more hourly aircraft and instrument operations typical of this level.

Radar terminals. Radar terminals at this level, because of the heavy density of traffic present, generally require 4 to 6 radar positions to be operational during the day and evening shifts. Because of the traffic demands, these positions tend to become more specialized in the particular control functions which they perform e.g., a particular position may handle only arrival or departure traffic.

More complex divisions of the control work and the assigned airspace are required at this level than in the GS-11 work situation. Thus more intricate procedures must be developed to insure that the necessary coordination is effected among controllers.

The complicating environmental and operational factors described at the GS-11 level are intensified by the heavy density of traffic characteristic of this level. Such factors as several busy runways, a substantial volume of helicopter traffic, provision of radar service to a number of satellite airports, and restrictive noise abatement procedures influence the already high level of difficulty and complexity characteristic of the GS-12 level.

Radar approach control terminals at this level typically handle from 20 to 59 instrument operations per hour (average) during the day and evening shift period.

Limited Radar Terminals. Limited radar approach control terminals typically average from 25 to 59 hourly instrument operations during day and evening shift hours.

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-13

GS-13 includes extremely difficult, exacting, and complex control work in the radar approach control terminals. This level is characterized by the requirement for radar control of air traffic under very demanding conditions imposed by extremely heavy densities of traffic handled on a regular basis; sustained periods of peak traffic activity with few lulls for any extended periods; very complex configurations of the terminal airspace; and very intricate and complicated procedures for controlling and expediting traffic utilized almost continually.

Knowledges, skills and abilities required. The GS-13 radar controller is distinguished from GS-12 by the significantly higher level of judgment, skill and ability required to control such an

extremely heavy density of traffic that there are few lulls during which accumulated traffic can be easily moved. Thus an error in judgment could result in major delays that would impact the movement of air traffic over a large area of the country.

The GS-13 controller regularly has a complex, congested and rapidly changing pattern of traffic under his control for prolonged periods. This pattern typically consists of a variety of aircraft with widely varying speed and performance characteristics.

Under the conditions of extremely heavy density and congestion characteristic of the GS-13 level, controlling aircraft with widely varying performance characteristics requires an exceptionally high level of ability, and rapid and precise judgments. Such problems as determining what headings to issue to aircraft, and the precise moment to issue sequencing and spacing instructions so that separation is maintained (i.e., fast aircraft do not overtake slower ones) are substantially more complex than at the GS-12 level. To handle traffic under these conditions for prolonged periods of time requires the GS-13 controller to plan, listen, speak and act almost simultaneously. Each sequence of control movements requires contacting several pilots and coordination with other controllers. Under these conditions, unexpected situations such as a sudden new rush of traffic, a declared emergency by an aircraft, or a sudden and severe change in weather conditions at the airport present problems of exceptional complexity for the GS-13 controller.

Complexity of the control environment. Characteristic of this level are those terminals which regularly handle an extremely heavy density and congestion of air traffic, significantly heavier than the peak traffic periods characteristic of the GS-12 level. Also typical of this level are very complex configurations and sectorization of terminal airspace. This is reflected in a larger number of navigational aids and specialized local procedures than is typical of the GS-12 level. Radar positions of operation at this level are more numerous and perform more specialized control functions. Because of the extremely heavy congestion of traffic as many as 7 to 10 radar positions may be required to handle such specialized functions as air traffic arrivals; departure traffic; operations at satellite airports; or the control of traffic transiting the assigned terminal area. Runway configurations are among the most complex and change frequently, requiring that controllers switch to different procedures for handling traffic many times during a typical work shift. Radar terminals at this level are typically located at major air carrier hub airports. These facilities are key terminals in the sense that delays occurring at these locations impact the movement of traffic over a large area of the country.

The demands placed on the skill, ability and judgment of controllers at this level by such factors as a large number of extremely complex configurations of airspace, restrictive arrival and departure corridors, complex and constantly changing runway configurations, noise abatement procedures, and mixtures of aircraft of different speed and weight categories are severely intensified by the extremely heavy density and congestion of traffic handled by the terminal, when compared to the relative difficulty and complexity of the terminal control environment at the GS-12 level. The

GS-13 radar controller has an extremely complex, congested and rapidly changing pattern of aircraft under control for prolonged periods. Pilot contacts and coordination with other controllers are practically continuous. The GS-13 level controller works under almost constant pressure to make exacting decisions, since errors in judgment or failure to expedite traffic could result in a major slowdown.

Radar approach control terminals characteristic of this level of difficulty and complexity regularly handle on the average from 60 to 99 instrument operations hourly during day and evening shift periods. Limited Radar Terminals. Limited radar approach control terminals typical of this level handle 60 or more instrument operations hourly (average) during day and evening shift periods.

AIR TRAFFIC CONTROL SPECIALIST (TERMINAL), GS-2152-14

The GS-14 level includes the most difficult and complex control work in the radar approach control terminals. The GS-14 work situation involves radar control under the most demanding and stressful conditions, which surpass the difficulties inherent in the radar work situation typical of the GS-13 level.

This level of control work is characterized by the requirement for handling sustained traffic densities that are appreciably greater than the extremely heavy densities of traffic typical of the GS-13 level. The pace of work is such that there are virtually no lulls in activity with peak periods tending to overlap. Continual, rapid and very precise coordination of control actions is required, not only within the terminal, but also between the terminal and the adjacent center(s) to accept or handoff aircraft.

This level of traffic activity requires the use of the most complex configurations of airspace and application of the most intricate and complicated procedures. Controllers in the work situation are under continuous pressure to move traffic rapidly to avoid excessive and costly holding of aircraft in the air or on the ground. They generally work with little relief from stress associated with such a demanding control situation, yet must remain calm and objective in the face of possible tension on the part of pilots whose flights are being delayed or held in the air. The

GS-14 work situation is further differentiated from GS-13 by the significantly greater scope and effect of the work, i.e., the critical importance of the most efficient and expeditious handling of air traffic to the operation of the national air traffic system, and the potentially adverse economic impact resulting from failure to maintain the highest levels of traffic activity. Failure to move traffic effectively at these terminals could result in nationwide air traffic problems as opposed to the more limited traffic bottlenecks in terminals with GS-13 work situations.

Operations for terminals at this level are critical to air carriers in that excessive delays would seriously impair aircraft turnaround and redistribution, and the carriers' ability to meet passenger and cargo schedules resulting in substantial economic impact. Such terminals, in addition to serving major population centers, extend service to other terminals throughout a major segment of the country. These terminals are geographically located so as to serve as the hub of a large number of heavily traveled air routes.

Five radar terminals are currently identified as having work situations characteristic of this level: the New York Common IFR Room, Chicago O'Hare, Atlanta International, Oakland Bay TRACON, and the Los Angeles International terminals. These five are differentiated from terminals at the GS-13 level primarily by the most extreme peaks of continuous air traffic density and congestion; the critical importance of these terminals to the nationwide movement of air traffic; and by the highly adverse economic impact which would result from a failure to

continuously provide the most efficient and expeditious handling of air traffic. Radar terminals at this level regularly handle 100 or more instrument operations hourly (average) during day and evening shift hours.

The five radar terminals identified as having work situations characteristic of the GS-14 level should not be construed as forever excluding other facilities from attaining this level, or forever including the five terminals specifically identified. Changes in the patterns of air traffic activity plus the anticipated growth in aviation may alter both the number and identification of terminals having work situations characteristic of the GS-14 level.

PART III -- AIR TRAFFIC CONTROL SPECIALIST (CENTER)

Center control functions

The primary function of the air route traffic control centers is the control and separation of air traffic within designated controlled airspace, along the airways and over certain oceanic routes. A network of centers located throughout the country and in certain areas outside the continental United States provides for an orderly flow of en route traffic and the interchange of traffic control between adjacent centers and the terminals.

In addition to controlling en route traffic, the centers also provide control services for IFR aircraft operating, during certain periods, to and from nonapproach control airports. Workload permitting, the centers provide advisory services to aircraft operating under visual flight rules. Such advisory service to pilots includes information as to the status of navigational aids, other air traffic of concern to the pilot, weather and airport conditions, and the status of restricted and military operating areas.

In airspace designated as positive control airspace, all air traffic is under the mandatory control of the centers. Safety requires positive control of the higher speed and performance aircraft which use that airspace. These aircraft fly too fast and high to rely on the "see and be seen" principle employed under visual flight rules procedures by slower speed aircraft at lower altitudes.

To fly within controlled airspace under instrument flight rules the pilot must file a flight plan which identifies the aircraft, its origin and destination, proposed route of flight, speed and proposed altitude. Based on traffic conditions, the center initiating control of the flight issues clearances specifying the route and authorized altitude, and when necessary, the time and initial direction for the departure.

Flight plan information is computer processed in the center to inform controllers within the facility initiating control of the flight that the aircraft will be entering their airspace and flying a specified route. The computer processed flight plan (flight progress strip) is forwarded to all adjacent

centers which will control the aircraft during the course of the flight and to the destination terminal.
Through the analysis of the flight progress strip information and constant radar surveillance, the center controller issues instructions to pilots on the proper flight headings and altitudes to maintain separation from other aircraft, to space arrivals and departures, to avoid severe weather, and to remain clear of restricted flight areas. The center retains control of aircraft until they are released to an adjacent center or the destination terminal.

ANALYSIS OF CLASSIFICATION FACTORS

In contrast with the terminals, the type of control exercised, the procedures and techniques employed, and the equipment utilized in the air route traffic control centers do not vary significantly.

With respect to the relevance of certain classification factors, a parallel exists between center and terminal positions in that while many factors are highly significant in the overall evaluation of center controller positions, these factors by themselves do not serve to distinguish among full performance level controller positions. For example, the nature and purpose of contacts between controllers and pilots is highly significant in the grade evaluation of center controllers as a class. However, the nature of these contacts and their intended purpose vary to such a slight degree among all the centers as to make meaningful distinctions of this factor impossible.

Center controller positions above the trainee and developmental levels may be distinguished on the basis of the measurable differences in the *Complexity of the control environment* and the concomitant impact on the level of *Knowledges, skills, and abilities required*. The influence of all pertinent classification factors (whether they tend to distinguish levels or not) is discussed below. However, the grade level descriptions for other than trainee and developmental levels do not treat in detail the non-distinctive factors, but instead focus mainly on those factors which are significant for grade determination.

Knowledges, skills, and abilities required

Because of the similarities in the kind of control exercised, the procedures and techniques employed, and the equipment utilized, the kinds of knowledges required are very similar for all center controllers. These include knowledges associated with:

-- The procedures for radar control and separation of aircraft utilizing vector, speed control, and altitude separation techniques;

-- The regulations and procedures governing the control and movement of air traffic;

-- The operation and adjustment of the automated radar system to provide the appropriate field of scan or information display, and the ability to detect malfunctions or interferences when these occur;

-- The computer routines for inputting or obtaining pertinent control data;

-- The airways structures within the center's area, pertinent geographic and terrain features, significant center traffic patterns and flows, and traffic patterns for terminal facilities;

-- The operational agreements with other air traffic facilities, procedures for handling military air operations, and the center's standard operating procedures for the assigned area of specialization;

-- The performance characteristics such as speed, rate of climb and maximum operating altitudes of a wide variety of aircraft; and

-- Significant weather patterns and phenomena peculiar to the center's assigned control area.

Even though the kinds of knowledges required of center controllers do not vary widely, the level of skills, abilities and judgment required are influenced significantly by the demands of the particular work situation. That influence is discussed throughout the remaining classification factors.

Complexity of the control environment

Relationship of traffic density to complexity. The influence of density and congestion of aircraft on the level of difficulty and complexity of center controller positions is overall very similar to the influence of this element on the complexity of terminal air traffic controller positions, i.e., it is the sustained density and congestion of traffic which controllers must handle that is most significant, rather than the absolute volume of aircraft handled, over a particular period.

A sustained density of traffic creates pronounced coordination problems and intensifies congestion of airspace. With a heavy density of traffic the control picture changes much faster causing continuing pressure for rapid control decisions, and for precise and rapid communications with pilots. Because of the greater density of air traffic, more complex configurations of airspace are required to handle the heavily congested patterns of traffic. Consequently, the center's procedures for handling a high volume of traffic are more complex and change more frequently.

Normally, a significant increase in air traffic requires a proportionally larger staff of controllers. The complexity of the control environment, however, depends on the elements of difficulty associated with the relative congestion of air traffic in each center's airspace rather than the number of air traffic controllers available to handle the traffic. Greater congestion of air traffic on a continuing basis places significantly greater demands on the individual controller's judgment, skill, and decision making ability in terms of his capacity to react rapidly and without error in

work situations that are often extremely stressful. In a higher density control environment with more complex configurations of airspace, there is a requirement for more rapid and precise coordination of control actions among the members of the larger staff.

The effect of traffic density on individual tasks and functions which controllers perform is likewise generally the same for centers as it is for terminals. A significant increase in center traffic affects: the level of coordination among the controllers; the criticality of and rapidity with which decisions must be made and actions taken; the degree to which optional plans for the movement and control of aircraft are reduced; and the complexity of the control procedures required.

The specific method for measuring traffic density in the centers is described under the section titled USE OF PART III.

Effect of other environmental and operational factors and complexity. The level of difficulty and complexity of air traffic control work in the centers is further influenced by such factors as:

-- Mixtures of transitioning (aircraft arriving or departing terminal areas) and en route traffic;

-- Unfavorable terrain features;

-- Restricted and military operating areas;

-- Numerous airports in the center's control area;

-- The configuration of the center's control area in terms of the number of navigational aids and fixes, converging and crossing air routes, and juxtaposition to international boundaries; and

-- Mixture of aircraft with varying operating speeds and performance characteristics.

While these factors may be present in different centers in various combinations and with varying degrees of intensity, the factors, in and by themselves, do not provide a meaningful basis for distinguishing between grade levels of center controllers in different work situations. For example, with few exceptions the mix of aircraft with varying operating speeds and performance characteristics using center airspace varies to such a slight degree among all centers as to make meaningful distinctions impossible. Similarly limitations on the use of assigned airspace because of terrain features, military operating areas, and restricted areas are found in virtually all centers.

Even though these factors, by themselves, may not serve to distinguish among grade levels, they do influence the overall level of difficulty of controller positions in much the same manner as similar environmental and operational factors influence the level of difficulty of terminal controller

positions, i.e., these factors take on increasing significance and importance with substantial increases in the density and congestion of air traffic.

Supervisory control over the work

Except for trainee and developmental levels, all center air traffic controller positions are characterized by a high degree of independence from supervision, and the responsibility for making and carrying out essentially unreviewed control actions. As in the terminals, the nature of center control work is such as to practically preclude any substantive technical review of control decisions. Technical review is thus largely confined to supervisory assessments of the adequacy with which controllers perform their functions, as well as periodic over-the-shoulder evaluations to gauge overall performance parameters.

Scope and effect of the work

Like their counterparts in the terminals, all center air traffic controllers are intimately and continuously concerned with safety and the protection of life and property. Further, this responsibility for safety of flight does not vary among the centers.

However, the requirement for orderly and expeditious movement of air traffic in situations involving saturation or near saturation of airspace does influence the level of difficulty and complexity of center controller positions. This is especially true in those instances where the traffic demands are such that errors in judgment or failure to handle traffic efficiently can cause significant delays along major airways of the country. The extent to which this element influences the level of individual center work situations is discussed in the grade level descriptions which follow.

Physical and mental demands

In contrast to the terminal facilities, all center positions work in a constant radar control environment. The physical and mental stresses associated with center control work are not unlike the stresses associated with the radar work in certain terminals. The degree of mental and physical stress present in any individual controller position is reflective of the complexity of the control environment. For this reason, no separate discussion of the influence of this factor is contained in the grade level descriptions. Instead the impact of this factor may be discerned from the discussions of control environment complexity.

Nature and purpose of personal contacts

Contacts between center controllers and pilots are similar to the contacts between terminal controllers and pilots in that they occur under generally the same circumstances, involve a similar range of subjects, and have generally the same objectives. While the level of proficiency of many of the pilots flying within certain controlled airspace may be somewhat higher (because of instrument rating requirements) than the proficiency of many of the pilots operating aircraft in and

around terminal areas, there is little measurable variance in the influence of this factor on the level of control work among all the centers.

As in the terminals, the significance of pilot and center controller contacts is most directly related to density of traffic. With substantial increases in density and congestion of traffic, pilot/ controller contacts become more critical and occur at a more rapid pace, often under very stressful conditions.

USE OF PART III

Part III is intended for use in evaluating non-supervisory controller positions in the air route traffic control centers. This part of the standard does not attempt to describe all of the positions of operation which exist at each grade level. Instead, each grade level is treated in terms of the key grade-determining characteristics.

To meet their particular operational requirements, each center's control area is divided along the line of traffic flows and patterns into a number of areas of specialization which are generally organized in such a fashion as to be roughly equivalent in terms of traffic workload and the relative difficulty and complexity of control assignments. Each area of specialization is comprised of a number of sectors which are constructed in terms of altitudes assigned for control, by area (e.g., oceanic areas), or by the type of control (manual v. radar).
Control work in the sectors is divided functionally into positions of operation. Such positions of operation may consist of the radar control of air traffic, or assisting the radar controller by accepting or rejecting the handoff of traffic from other controllers or facilities.

Normally, each center has an established work assignment program whereby the full performance level controllers are rotationally assigned to the more difficult positions of operation in all sectors within an area of specialization. In this manner they are spelled from the stress of continuous exposure to the same control situation, and maintain control proficiency in a variety of work assignments. Trainee and developmental controllers likewise follow a regular rotational program as a part of their career development program. Developmental controller work assignments vary according to the individual's progress in meeting phased objectives of the training program.

Because of these rotational work assignments within areas of specialization which are roughly equivalent in terms of relative difficulty, the full performance level controllers perform control work which is generally reflective of the overall complexity of each center. For these reasons, the grade level descriptions in this part are designed to measure (for other than trainee or developmental level positions) that level of difficulty which is most typical of the overall level of complexity associated with each center.

This does not mean that there is no longer a requirement to evaluate each controller position within any center. All air traffic controller positions within a center must be examined to insure that the level of work performed is comparable to the overall complexity associated with that particular center, i.e., that areas of specialization are roughly equivalent in terms of difficulty and complexity, and that a regular plan of rotational assignments is followed.

This standard is not geared to evaluate full performance level positions which tend to specialize on the duties of one or a few positions of operation, and which do not regularly perform the duties of all radar positions of operation within an area of specialization. Where such specialized positions exist, they should be examined individually to determine the appropriate grade level in relationship to the normal grade of full performance level controllers in that particular work situation.

Measurement of traffic density. Traffic density for center controller positions is expressed in terms of the average hourly IFR aircraft handled, i.e., an aircraft operation in accordance with an IFR flight plan or an operation where IFR separation between aircraft is provided. The number of aircraft handled is computed by multiplying the number of IFR departures times two and adding the number of IFR overflights. The intent here is to measure arrivals, departures and overflights; by doubling the number of departures, the arrival traffic will be measured.

The segment of the work cycle measured for centers is the same as for the terminals -- the busiest 183 days in terms of total IFR aircraft handled. The average hourly operations count for the day and evening shift periods is likewise derived in the same manner -- the sum total of aircraft handled on the busiest 183 traffic days divided first by 183, then by 16. As in the terminals, center air traffic activity declines sharply during the mid-shift hours. The intent here is to measure the heaviest traffic periods which are the day and evening shift hours.

Minimizing unwarranted grade level fluctuations. In computing and applying average hourly traffic densities, it is the intent of this standard to avoid frequent fluctuations in grade level which may be caused by minor or temporary increases or decreases in traffic activity. Due to the nature of the en route control function, it is unlikely that the level of traffic activity would be materially affected in the same manner as, for example, a runway closure might affect the level of activity in a terminal work situation.

On an overall basis, however, traffic activity in the centers will change for a variety of reasons and a measure of stability may be achieved, and unwarranted grade level fluctuation avoided, by delaying action to change controller grade levels until the probable permanency of the change in traffic density can be established. The following procedures are to be followed to determine this permanency, and to assure that grade changed are made only where appropriate.

Raising facility grade levels. When a center's average hourly operations count indicates that positions may warrant upgrading, a projection should be made of that facility's anticipated traffic activity for a reasonable and representative period (e.g., 18 months). If this projection, based on

past experience plus anticipated changes in traffic activity, shows that the facility activity will remain at or above that hourly traffic density figure, action to change the grade levels should be accomplished promptly. If on the other hand, the traffic projection indicates that the facility's activity is unlikely to remain at or above the hourly traffic density figure, the grade level changes should not be made.

Lowering facility grade levels. Where decreases in the average hourly operations indicate that lowered grade levels might be warranted, a buffer zone concept should be utilized to prevent precipitous grade adjustment, i.e., average operations which fluctuate no more than five percent below the minimum number of operations for a particular grade should be considered borderline and retained in grade. The same type of traffic activity projection, as described above, should be utilized to establish the probable permanency of the change. Every effort should be made to retain grade levels where projections indicate that the facility would at least maintain a level of traffic activity which would place it within the buffer zone. However, where traffic projections clearly indicate that the level of activity will remain below the buffer zone, action to change positions to lower grade is appropriate.

GRADE LEVELS

AIR TRAFFIC CONTROL SPECIALIST (CENTER), GS-2152-05

This is a trainee level for center controllers. GS-5 center controllers receive training and indoctrination in such subjects as: air traffic rules; airport traffic control; communications operating procedures; principles of flight; air navigation; aids to air navigation; aviation weather; and terrain, navigational aids, reporting fixes and airway structure in the center's control area.
GS-5 employees are under direct supervision. Higher level controllers observe the work on a continuing basis to insure proper performance of tasks and to provide training in basic controller skills.

AIR TRAFFIC CONTROL SPECIALIST (CENTER), GS-2152-07

This is a developmental level for center controllers. GS-7 center controllers receive training in the subjects described at GS-5 and, in addition, perform some of the basic tasks required in center work.

GS-7 center controllers perform such tasks as receiving, processing, and delivering flight plan information; operating the communications system; entering flight data into the computer and coordinating flight data processing problems; servicing the flight data strip printer; and processing flight plans manually.

Initially, the GS-7 controller is under direct supervision. As the GS-7 progresses through training, the employee works at routine assignments with more independence than the GS-5 controller. On less routine tasks, e.g., those that would otherwise be characteristic of the GS-9 level, GS-7 controllers are evaluated in terms of their potential to perform those tasks with greater independence.

AIR TRAFFIC CONTROL SPECIALIST (CENTER), GS-2152-09

This is an advanced developmental level for center controllers. Under close supervision and guidance, GS-9 center controllers assist controllers of higher grade by performing various control tasks.

GS-9 center controllers perform such duties as: recording clearances and control information on flight data strips; relaying clearances; entering flight data into the computer; maintaining a continuous record of traffic; reviewing proposed and active flight plans to resolve discrepancies; sequencing of flight progress strips; and coordinating with other center controllers.

At the time of each assignment to a new kind of work, the GS-9 receives close supervision and guidance. As the GS-9 controller completes various phases of the developmental program, the work is spot-checked and the GS-9 works with more independence than the GS-7 controller. Employees are evaluated both on their performance as a GS-9 and on their potential for progression to higher levels.

AIR TRAFFIC CONTROL SPECIALIST (CENTER), GS-2152-11

GS-11 center controller assignments vary between the performance of control functions as a team member, and assignments geared to qualify the controller to operate a limited number of radar control positions.

As a team member, GS-11 center controllers assist radar controllers of higher grade by performing such work assignments as: establishing and maintaining separation of aircraft using non-radar (manual) procedures; sequencing of air traffic for orderly handoff; accomplishing handoffs with adjacent controllers or facilities; issuing departure clearance, beacon code and altitude assignments; employing holding procedures; and providing in-flight weather advisories.

In comparison with the GS-9 controller who sequences traffic and issues clearances to pilots directly or indirectly, the GS-11 controller plans aircraft movements and issues instructions directly to the pilot. GS-11 center controllers make more frequent and difficult decisions than the GS-9 controller because of the greater complexity in sequencing aircraft and determining their movements, and the need for more frequent coordination with pilots and other controllers. More frequently than the GS-9, the GS-11 must provide approach or en route clearances to pilots and furnish information to other controllers regarding traffic entering their sectors. The GS-11, therefore, has less time for acting or reacting, for correcting mistakes or for clarifying instructions than does the GS-9.

The GS-11 controller has the added responsibility for such actions as executing shortened holding patterns to expedite aircraft movements, and directing deviations from normal courses and speeds to reduce potential delays, which the GS-9 controller is not normally called upon to do.

At this level controllers apply previous training and on-the-job qualification to operate, under general supervision, a limited number of radar control positions. This is in contrast to the GS-9 level where the emphasis is more on training to provide basic radar control skills and techniques.

Controllers at this level receive only general guidance and supervision while performing the duties of those positions of operation on which they have qualified. Developmental on-the-job assignments to qualify on radar control positions are performed under the technical direction of full performance level controllers.

AIR TRAFFIC CONTROL SPECIALIST (CENTER), GS-2152-12

The GS-12 level of difficulty and complexity is characterized by the first full performance level of radar control in the centers. At this level controllers perform, under general supervision, the duties of all radar positions of operation within an assigned area of specialization in those centers which typically handle traffic densities ranging up to 169 IFR aircraft handled per hour (average) during the day and evening shift periods.

GS-12 level controllers are responsible for the independent control and separation of aircraft under the reduced separation standards typical of radar control. This is distinguished from manual control assignments at the GS-11 level because radar involves more positive and continuous control over aircraft than does the GS-11 manual control work situation.

Because of the reduced separation standards in radar control, the GS-12 level requires more precise and rapid judgments than GS-11 in applying a comprehensive knowledge of the operating characteristics of a wide variety of aircraft. With the lesser distances separating aircraft operating at widely varying speeds, the GS-12 controller must react more quickly, with far less tolerance for error, to prevent potential conflict situations than the GS-11.

The GS-12 radar controller has a more constant control responsibility because radar displays the traffic situation continuously. Thus, in this situation, the GS-12 radar controller must continually issue instructions to pilots on what headings to follow to maintain separation, what altitudes to fly to remain clear of traffic, and what maneuvers are necessary to avoid severe weather or to remain clear of restricted or special military operations areas.

GS-12 control assignments are distinguished from similar assignments at the GS-11 level by the greater degree of freedom from supervision and the requirements for performing the duties of a much broader range of radar positions. Where at the GS-11 level assignments are geared to

qualify the controllers to perform the duties of less than the full scope of the radar positions, GS-12 full performance level assignments involve the independent performance of radar control duties for all sectors within an area of specialization.

Center control work at this level is characterized by the presence of such complicating environmental and operational factors as: size and configuration of center airspace; mixture of arriving, departing and en route traffic; mixtures of aircraft with widely varying operating speeds and weights; unfavorable terrain features; military operations and restricted areas; a large number of navigational aids and reporting fixes; numerous airports and airways in the area; and the regular occurrence of special military missions and training operations. A substantial number of these or similar complicating factors are found in the GS-12 situations on a regular and recurring basis.

The GS-12 center controller must have a detailed knowledge of: all techniques and procedures for separation and control of air traffic using radar; the special operating procedures for all radar positions of operation within the assigned area of specialization; the letters of agreement and operational procedures for coordinating traffic flows with other air traffic facilities adjacent to the area of specialization; the procedures pertaining to military operations and training areas; and the traffic patterns and flows characteristic of the area of specialization.

AIR TRAFFIC CONTROL SPECIALIST (CENTER), GS-2152-13

The GS-13 level involves extremely difficult and complex radar control work in the centers, and places exceptional demands on the GS-13 radar controller, which surpass the difficulty inherent in the GS-12 radar control assignment. Where GS-12 center controllers regularly handle traffic densities ranging up through heavy, the GS-13 center work situation involves recurring traffic densities which are characterized as extremely heavy and range on the average from 170 to 274 IFR aircraft handled hourly.

GS-13 full performance level controllers, like those at the next lower level, regularly perform the duties of all radar positions of operation within an assigned area of specialization. However, the characteristics of the GS-13 level work situation impose on the controller the requirement for a substantially higher level of skill, judgment, and decision making abilities than the GS-12 work situation.

The greatly increased traffic density at the GS-13 level not only imposes the requirement for controlling appreciably more aircraft within closer tolerances, but there is less time to analyze traffic situations, formulate the control decision and communicate these instructions to the greater number of aircraft occupying the airspace. Planning and coordinating the movements of the greater number of aircraft with different speed and performance characteristics, requires almost constant communications between controllers and pilots for sustained periods.

The extremely heavy density and congestion of air traffic typical of this level requires almost continuous use of minimum separation among aircraft and severely limits the number of

alternatives that might otherwise be employed to control and separate traffic. Consequently the GS-13 controller works at a much faster pace and under greater stress than the GS-12.

Thus, a substantially higher level of control skill, judgment and decision-making ability are required at this level than at GS-12. Because of the greater congestion of traffic present in the GS-13 level control situation, these centers must devise a larger number of more intricate and complex sector configurations of airspace. With the increased intricacy and complexity of airspace configurations, the GS-13 controller must maintain an intense knowledge of more complex and precise control procedures to insure that proper separation is maintained and that aircraft under his control do not penetrate airspace assigned other controllers without prior coordination. For example, under the time and space limitations imposed by the sustained congestion and density of traffic characteristic of the GS-13 level control environment, the center controller for prolonged periods must separate and place intrail many types of aircraft operating at widely varying speeds (e.g., 200 knots or better), descending from various altitudes, crossing and converging from several directions. In such situations the GS-13 controller must use to a significantly greater extent than the GS-12 his knowledge of:

-- the general relation of speed to descent rate at various speeds and altitudes for many types and weight categories of aircraft;

-- the effect of seasonal temperature variances on the operational parameters of aircraft;

-- the relation of indicated airspeed to groundspeed at different altitudes; and

-- the minimum and maximum operating speeds and climb rates for each type of aircraft under control.

Those complicating environmental and operational factors described at GS-12 are present in the GS-13 work situation, but the extremely heavy density and congestion of air traffic characteristic of the GS-13 level materially increases the difficulty of the problems that combinations of these factors present to the GS-13 controller. The extremely heavy density of traffic typical of this level leaves less airspace for each aircraft and requires minimum separation among aircraft. Consequently, the GS-13 controller must work with greater speed, within closer tolerances and under more stressful conditions than the GS-12.

Similarly, the sustained and extremely heavy density of traffic characteristic of this level greatly intensifies the difficulty and complexity of such problems as those involved in controlling and coordinating the movements of a much greater combination of arriving, departing and en route traffic on crossing or converging flight patterns at and around numerous high activity airports. For example, more frequently and for longer periods the GS-13 controller must change aircraft from intrail to vertical separation over holding fixes. Because of the much greater density of traffic controlled for longer periods, the GS-13 must exercise greater judgment and make quicker

decisions than the GS-12 so as to assure that holding aircraft are in the correct positions to proceed in the proper direction and sequence when the saturation condition clears. Errors in judgment, or the failure to make rapid and precise decisions, in such situations as these, could cause major delays and bottlenecks along heavily used airway routes and at major airport terminals, ultimately impacting the efficient movement of traffic over a large area of the country.

AIR TRAFFIC CONTROL SPECIALIST (CENTER), GS-2152-14

The GS-14 level includes the most difficult and complex air traffic control work situations in the centers. The GS-14 level work situation involves controlling the most extreme and continuous peaks of traffic density and congestion under the most demanding and stressful conditions, which surpass the difficulties inherent in the GS-13 level control situation.

This level of control work is characterized by the requirement for handling sustained traffic densities that are appreciably greater than those extremely heavy densities of traffic typical of the GS-13 level. The pace of work is such that there are virtually no lulls in activity with peak periods tending to blend and overlap. Continual, rapid, and precise coordination of control actions is required among the center controllers and with controllers in adjacent terminals and centers to insure efficient and rapid interchange of the control of air traffic.

Controllers in this work situation are under continuous pressure to move traffic rapidly and efficiently so as to avoid excessive and costly holding of aircraft. They must apply a thorough knowledge of the procedures, action plans and problems of the major terminals served. They generally work with little relief from the stress associated with such a demanding control situation, yet must remain calm and objective in the face of possible tension on the part of pilots whose flights are being delayed on the ground or held in the air.

The GS-14 level is further differentiated from GS-13 by the significantly greater scope and effect of the work, i.e., the critical importance of the most efficient and expeditious handling of air traffic to the effective operation of the national air traffic system, and the potentially adverse economic impact resulting from failure to maintain efficient movement of traffic during these highest levels of traffic activity. Failure to perform effectively in this situation could result in nationwide air traffic bottlenecks and slowdowns as opposed to the more limited traffic problems which would be caused by a similar lack of efficiency in centers with GS-13 level work situations.

Excessive traffic delays or slowdowns incurred by centers at this level would seriously impair airline operations by disrupting equipment turnaround and redistribution, require the excessive use of fuel, and cause delays in passenger and cargo schedules, all of which would result in great inconvenience to the general public and in substantial economic impact on major industries.

Three of the air route traffic control centers are currently identified as having work situations characteristic of this level, the Chicago, New York, and Cleveland centers. The three are differentiated from centers at the GS-13 level by the significantly greater traffic densities handled on a continuous basis; the critical importance of these centers to efficient operation of the national air traffic system; and the substantial economic impact which would result from failure to accept and efficiently handle the exceedingly high air carrier traffic densities. Centers at this level regularly handle 275 or more IFR aircraft hourly (average).

The three centers identified as having work situations characteristic of the GS-14 level should not be construed as forever excluding other centers from attaining this level, or forever including the three centers specifically identified. Changes in the patterns of air traffic activity plus the anticipated growth in aviation may alter both the number and identification of centers having work situations which meet the criteria for the GS-14 level.